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MEDICAL CHEMISTRY AND "THE PARACELSIANS" *

ROBERT MULTHAUF

I. Introduction: The Problem of Paracelsus' Pharmacopoeia

Despite his well known disdain for books, Paracelsus seems to have left a larger body of written doctrine than any previous chemist or physician since antiquity. His medico-chemical writing is so widely dispersed throughout his works that it has effectively defeated all attempts at its comprehensive elucidation, but until quite recently, students of the history of medicine have generally agreed that his greatest contribution to that science was the introduction into the pharmacopoeia of internal medicine of remedies drawn from the mineral kingdom.[1] As his prede-

* This article represents, in revised form, chapters 5 and 6 of the author's dissertation on "The relationship between technology and natural philosophy, ca. 1250-1650, as illustrated by the technology of the mineral acids," submitted to the University of California in 1953 for the Ph. D. degree.

[1] Daniel Le Clerc attributes Paracelsus' fame to his remarkable cures, noting also that he depended much more on metallic medicines than on those of animal or vegetable origin (*Histoire de la Médecine*, La Haye, 1729, pp. 812-13). Kurt Sprengel declared that Paracelsus' great merit is to have recommended medicines drawn from the mineral realm in place of the "syrops and useless concoctions" recommended before him (*Histoire de la Médecine*, 9 vols., Paris, 1815-32, vol. III, p. 332). Heinrich Haeser regards therapy as "the beginning, middle, and end" of Paracelsus' teaching, and quotes the latter's view that "the whole world is a druggist's shop." Haeser mentions iron, lead, copper, antimony, and mercury as exemplifying the contents of this shop, but goes on to note that Paracelsus recognized that both diseases and cures could be spiritual (*Lehrbuch der*

cessors and contemporaries have become better known, his supposed pharmaceutical innovations have been questioned more and more, while, with the modern elaboration of the science of medicine, other facets of Paracelsus have attracted attention. The recent republication of *On the Diseases that Deprive Man of His Reason* reflects the present interest in his theories of mental illness, and the editor of that edition declares, "it is necessary to weed out the Paracelsian pharmaceutical divagations, which were more of a reflection of the time than a product of strict originality."[2]

Paracelsus' medical chemistry was indeed a reflection of the time. A line of descent of some of the most popular chemical medicines, particularly those derived from gold, mercury, and antimony, can be traced through John of Rupescissa, Phillip Ulstad, Conrad Gesner, and others, perhaps without bringing Paracelsus into the picture at all. Nevertheless he is not easily disentangled from these "pharmaceutical divagations," for in the eyes of his contemporaries as well as in those of subsequent historians of medicine the chemical remedies were very close to the center of "Paracelsianism." This was, in fact, the reason why Adam of Bodenstein, the first editor of *The Diseases that Deprive Man of His Reason*, had become interested in Paracelsus.[3] Petrus Severinus, another notable sixteenth century physician who developed a great interest in Paracelsian theories, also tells us that it was the remedies which first interested him.[4] And such "neutral" observers as Winter von Andernach and Petrus Matthiolus also make clear the close connection which was supposed to exist between Paracelsus' chemical, particularly mineral, remedies, and his whole medical doctrine.[5] It is then probable that whatever may be the

Geschichte der Medicin, third ed., 3 vols., Jena, 1875-82, vol. 2, pp. 25-6; 105-6). F. H. Garrison calls Paracelsus "the founder of chemical pharmacology and therapeutics" (*An Introduction to the History of Medicine*, Philadelphia, 1913, p. 188). A. Castiglioni gives similar credit (*A History of Medicine*, New York, 1941, pp. 445-50). But both Garrison and Castiglioni give considerably less emphasis to the chemical pharmacy than did the earlier writers.

[2] Introduction to Paracelsus, *On the Diseases that Deprive Man of His Reason*, trans. G. Zilboorg, in H. Sigerist, et al., *Four Treatises of Theophrastus von Hohenheim*, Baltimore, 1941, p. 132.

[3] He tells in his introduction how he had been unsuccessfully treated for tertian fever (exquisita tertiana) at Basel in 1556. Finally a friend gave him a prescription attributed to Paracelsus, which cured him. Its ingredients were "spiritus vitrioli, liquor serapini, laudani, etc. . . . thus I became a clandestine disciple of Theophrastus, applying as much as I could the arcana and the medicines which he had advised." (trans. Zilboorg, *op. cit.*, p. 137).

[4] "Having heard certain Paracelsian remedies praised in Germany, I began diligently to read his writings" (*Idea medicinae philosophicae*, Basileae, 1571, dedication).

[5] See Andernach's *De medicina veteri et nova*, Basel, 1571, pp. 25-27, and Matthiolus' *Commentaires sur Ped. Dioscor. Anazarbeen*, Lyon, 1579, ch. 59, pp. 740-41.

modern judgment of his pharmacopoeia, it was no incidental part of his doctrine. His role in the development of medical chemistry, either as an originator or as a publicist, was a significant one.

The problem of elucidating the relationship between Paracelsus and the pharmacopoeia of medical chemistry is made considerably more difficult by the lack of consistency in the treatment of remedies in his various works. The remedies in *Archidoxies,* which Sudhoff has called "the fundamental text of the new specific therapeutics on a chemical basis,"[6] are not easily identified with the remedies proposed for specific diseases in his other works. Of the productions of *Archidoxies,* only quintessences and arcana are referred to more than cursorily in *On the Diseases that Deprive Man of His Reason,* and even these two are not correlated with the quintessences and arcana in *Archidoxies.*[7] The preparation of the remedies mentioned in *On the French Disease* is not described, but their names do not correspond to any of those in *Archidoxies.*[8] The situation is approximately the same in the treatise *On the Miner's Sickness,*[9] and, with a few exceptions, the remedies in *On the Diseases Arising in Tartar* are not "chemical" at all.[10] Taking these four treatises in consideration, two materials, vitriol and tartar, are mentioned in connection with remedies in all four. Laudanum is prominently mentioned in three, mumia, gold, antimony, and mercury in two. In almost every case the identification of these remedies with those mentioned in *Archidoxies* is very conjectural.[11]

[6] "The literary remains of Paracelsus," *Essays in the History of Medicine,* New York, 1926, p. 275.

[7] *Von den Krankheiten, so die Vernunfft berauben* was written ca. 1525. See the English translation of Zilboorg, *op. cit.,* pp. 168-9, 173-8, 180-82, 187. *Archidoxies* is analyzed in E. Darmstaedter, *Arznei und Alchemie,* Studien zur Geschichte der Medizin, H. 20, Leipzig, 1931, and in T. P. Sherlock, "The chemical work of Paracelsus," *Ambix,* 3 (1948), pp. 33-63.

[8] *Von der französischen Krankheit 3 Bücher,* in Paracelsus, *Sämtliche Werke,* ed. Sudhoff, München, 1922-31, Abt. I, Bd. VII, pp. 67-182. This work was published at Cologne in 1530. See especially the remedies mentioned on pp. 110-111, 178-81.

[9] *Von der Bergsucht* was written ca. 1533. See the English translation of G. Rosen in Sigerist, et al., *Four Treatises,* especially pp. 75-6, 92-3, 101.

[10] *De morbis ex tartaro oriendis libri duo,* in Paracelsus, *Sämtliche Werke,* ed. Sudhoff, Abt. I, Bd. V, pp. 1-123. This work was written ca. 1527. Of 93 remedies mentioned, 14 are mineral, 11 involve laudanum, 5 tartar, 5 mumia, and 1 animal matter. The others are vegetable.

[11] This question is discussed in detail in my "The relationship between technology and natural philosophy, ca. 1250-1650, as illustrated by the technology of the mineral acids," (Ph. D. dissertation, University of California, 1953), pp. 144-51.

It is evident from the way in which Paracelsus ordinarily prescribes vitriol, as oleum vitrioli, spiritus vitrioli, etc., that he was particularly concerned with sulphuric acid.[12] Aqua fortis (usually nitric acid) is less prominently mentioned by Paracelsus than it was by some other writers. In the treatises under consideration these acids are frequently prescribed for direct medical use, albeit usually diluted. Use of the acids as *reactants* for the preparation of medicines was a feature of *Archidoxies,* according to the most probable interpretation of that work, but it is not clear that many of the remedies in the other treatises here considered were so prepared. Tartar, for example, is mentioned as oil, liquor, juice, essence, and the like, of tartar—terms commonly referred to various forms of the distillate or residue from dry distillation of the wine cask concretion—while the later very popular medicine prepared from tartar and sulphuric acid, and usually called vitriolated tartar, appears to be absent from these treatises.

The identity of Paracelsus' laudanum has been much disputed. Angelo Sala, writing in 1614, credits Paracelsus with "the invention of the true preparation" of opium, by "mitigating its causticke and aduring acrimonie" with spirit of vitriol, and calls the product laudanum. But he also mentions other "spagyrick" non-opiate laudanums such as "a certain embrionated sulphur of vitriall," for which he also cites Paracelsus.[13] Thomas Thomson identifies Paracelsus' laudanum as two things, red oxide of mercury and a mixture of butter of antimony with several herbs.[14] Sigerist, in a recent study of the identity of Paracelsus' laudanum, finds the term used for two categories of drug, one based on gum ladanum, from the flowers of several varieties of Cistus, a vegetable preparation known in antiquity, and the other, one of his arcana, a compound usually containing pearls.[15] Mumia, on the other hand, was a venerable medical curiosity long before Paracelsus. According to Dr. James, it was a term originally applied to the desiccated bodies of travelers who had perished in the Sahara, and to the embalmed bodies in Egyptian tombs. It was also

[12] See *On the Diseases that Deprive Man of His Reason,* trans. Zilboorg, *op. cit.*, pp. 170-72; *Von der französischen Krankheit 3 Bücher,* ed. Sudhoff, *op. cit.*, pp. 178-81; *On the Miner's Sickness,* trans. Rosen, *op. cit.*, pp. 75, 93; *De morbis ex tartaro oriendis libri duo,* ed. Sudhoff, *op. cit.*, pp. 112, 116.

[13] *Opiologia* . . . done into English and something enlarged by Tho. Bretnor, London, 1618, pp. 33, 52. As I have not seen the original edition of this work, it is possible that these remarks belong to Bretnor.

[14] *History of Chemistry,* London, 1830-31, vol. I, p. 147, note.

[15] "Laudanum in the works of Paracelsus," *Bulletin of the History of Medicine,* vol. 9 (1941), pp. 530-44.

applied to "parts of bodies embalmed with Myrrh, Aloes, Incense, etc., by the Jews," and, by Paracelsus and others after him, to other things "real and imaginary," the marrow of bones, "balsam of the external elements," manna, water from the breath of a man, collected in a phial, and "an extremely subtile, spirituous and aethereal substance, innate in every body and remaining there after death, and capable of correcting its own morbid disposition." [16]

The minerals mentioned most frequently, vitriols, gold, antimony, and mercury, are exactly those esteemed by John of Rupescissa, Ulstad, and Gesner, among others. With the exception of vitriol they do not play a very prominent part in the works of Paracelsus surveyed here.[17] Gold is mentioned in such connections as aurum consolidativum and aurum lunificatum, the preparation of which I have found nowhere in Paracelsus' writings. *Archidoxies* mentions a preparation of quintessence of gold, at least by inference, and this estimable preparation appears as a medicine in *On the Diseases that Deprive Man of His Reason.* Mercurial and antimonial preparations, around which the subsequent controversies over chemical medicines chiefly raged, play a very minor role in these treatises. With the possible exception of antimony trichloride (butter of antimony),[18] neither here nor in *Archidoxies* do we find clear indications of previously unknown chemical preparations, although there are the usual occult suggestions that Paracelsus knew more than he tells. From the criticism of mercury treatment contained in *On the French Disease* and in *Seven Defensiones,* it would appear that Paracelsus did not favor its use in medicine.[19] But the testimony of his disciple, Operinus, and the

[16] R. James, *A Medicinal Dictionary,* London, 1743-45, article, "mumia."

[17] That the treatises I have used contain the majority of the mineral remedies used at all by Paracelsus is suggested by Andernach's list of his remedies: "sulphur, antimony, chalcanthum, sale nitro, mercury, gold, silver, lead, and iron." He also mentions a number of precious stones. (*De medicina veteri et nova,* Basel, 1571, p. 27)

[18] One of the arcana in *Archidoxies* is "mercurius vitae," prepared by sublimating antimony with "mercurius essensificatus." If the latter was corrosive sublimate this may be the first account of the preparation of butter of antimony. At least I know of none earlier. See *Neun Bücher Archidoxies,* ed. Sudhoff, in Paracelsus, *Sämtliche Werke,* Abt. I, Bd. III, p. 147. Oswald Croll tells us that butter of antimony is called by the vulgar mercurius vitae (*Basilica chymica,* Venetiis, 1643, p. 80). See also Sherlock, "The chemical work of Paracelsus," *Ambix,* 3 (1948), p. 59. Matthiolus credits Paracelsus with the discovery of the "laxative virtue" of antimony (*Commentaires,* p. 740), but Dr. James says that Paracelsus does not often mention antimony purgatives (*Dictionary,* vol. I, p. lxxxvi).

[19] See Paracelsus, *Sämtliche Werke,* ed. Sudhoff, Abt. I, Bd. VII, p. 169, and *Seven Defensiones,* trans. C. L. Temkin, in Sigerist, et al., *Four Treatises,* p. 22.

general opinion of later writers, suggest that he used it extensively, especially in the form of red precipitate (of mercuric oxide).[20]

II. The Paracelsians

The question of Paracelsus' relationship to medical chemistry thus remains loaded with doubts and contradictions. But there is no doubt that this school of medicine was carried to the successful conclusion of its battle for acceptance by the medical profession by men who were regarded by others, and who seem to have regarded themselves, as his followers. From the middle of the sixteenth century, the pharmacopoeia of medical chemistry attained a popularity which approached, if it did not equal, that of the Galenic pharmacopoeia. Although this is evident in the writings of many prominent physicians and chemists of that time, with the notable exception of a group of physicians sometimes called the " mysochimiques," led by the Paris medical faculty, who carried the fight for conservatism against modification of the traditional pharmacopoeia, it is most closely associated with a group which has been dubbed " the Paracelsians." It is evident from an inspection of the works of the men who have been so classified that their adherence to Paracelsus does considerably surpass the mere adoption of chemical remedies supposed to have derived from him, for they are not only characterized by devotion to medical chemistry, but by a strong predilection for medico-philosophical theory resembling that propounded by Paracelsus himself.

Among the most prominent of these Paracelsians, those whose works are included in this study are the following:

Gerard Dorn, *Clavis totius philosophiae chymisticae* (Key to the whole chemical philosophy), Lugduni, 1567.[21]

Peter Severinus, *Idea medicinae philosophicae* (Archtype of the philosophy of medicine), Basiliae, 1571.[22]

Oswald Croll, *Basilica chymica* (Cathedral of chemistry), Francofurti, 1609.[23]

Joseph Du Chesne (Quercetanus), *Pharmacopoea dogmaticorum resti-*

[20] Operinus' celebrated letter on Paracelsus in which reference is made to the latter's " pulvis praecipitati " is included in Daniel Sennert, *De consensu et dissensu*, *Opera*, Lugduni, 1676, p. 188. See also *Paracelsus, His Dispensatory and Chirurgery*, faithfully Englished by W. D., London, 1656, p. 264, and James, *Dictionary*, vol. I, p. lxxxiii.

[21] Hereinafter cited as Dorn, *Clavis*.

[22] Hereinafter cited as Severinus, *Idea*.

[23] I have used the Venice edition of 1643, hereinafter cited as Croll, *Basilica*.

tuta (The dogmatic [Galenic] pharmacopoeia restored), Grossae Hassorum, 1607.[24]

David de Planis-Campy, *Bouquet composé des plus belles fleurs chimiques*, Paris, 1629.[25]

Johann Hartmann, *Praxis chymiatrica* (Iatrochemical practice), Lipsiae, 1633.[26]

Theodore Turquet de Mayerne, *Praxeos Mayernianae . . . syntagma*, London, 1690.[27]

Dorn, a pupil of Adam of Bodenstein the publisher of *On the Diseases that Deprive Man of His Reason*, and himself an editor of some of Paracelsus' works, published his *Clavis totius philosophiae chymisticae* in 1567. Its first part is practical, and bears a closer resemblance to a modern textbook than any previous work. Such theory as is incorporated relates more to the alchemists and the Aristotelians than to Paracelsus. But there is a second part, on "The seven steps of speculative philosophy, through which one comes to sublimity of mind." These seven steps correspond to "the seven operations" of chemistry, and:

> The study of the philosophers is compared to chemical putrefaction, since just as philosophers come to cognition through study, so natural things come to solution through putrefaction: [!] [28]

This bizarre idea is developed through a series of colloquia between mens and corpus, spiritus and anima, etc., none of which seem to be related to the subject matter of the first book. Paracelsus is frequently mentioned, although it is unclear to what extent this theorizing is indebted to him.

Severinus, one time physician to the king of Denmark, became a Paracelsian in somewhat the same way as had Bodenstein:

> Since it is often observed in the work of the art [of medicine] that Galenic theory (much less the remedies) fails to effect the cure of difficult diseases, and since I had heard certain Paracelsian remedies praised at various places in Germany, I began more diligently to read his writings. . . .[29]

---

[24] Citations are from the abbreviated version, *De dogmaticorum medicorum legitima et restituta medicamentorum praeparatione*, which was published with his *De priscorum philosophorum verae medicinae materia*, S. Gervasii, 1603. Hereinafter cited as *Pharmacopoea*.

[25] Hereinafter cited as Planis-Campy, *Bouquet*.

[26] I have used the Frankfort edition of 1634, hereinafter cited as Hartmann, *Praxis*.

[27] I have used the Augsburg edition of 1691, hereinafter cited as Mayerne, *Syntagma*.

[28] "Ita res naturales per putrefactionem ad solutionem." Dorn, *Clavis*, p. 281.

[29] Severinus, *Idea*, Dedication.

Nevertheless his *Idea medicinae philosophicae* (1571) is entirely theoretical, and no specific remedies are mentioned.

The other five, Croll, Du Chesne, Planis-Campy, Hartmann, and Mayerne, were among the best known physicians of their time, and occupied positions in the highest court circles of Germany, France, and England, a testimonial to the growing popularity of medical chemistry. Each of them wrote a pharmacopoeia in which the chemical remedies were promulgated, and it was their success in the quarrel with the "mysochimiques" which was largely responsible for the introduction of chemical remedies into the seventeenth century editions of the great pharmacopoeias. Yet without exception they adhered as well to the Paracelsian philosophy or at least to something closely akin to it. Croll has been called "one of the founders of Pharmacy," [30] and his pharmacopoeia, *Basilica Chymica,* is perhaps the most clear and comprehensive statement of what the chemical remedies were, for most of the others included both chemical and Galenic remedies. But Croll's *Basilica,* like Dorn's *Clavis,* contains a second and quite independent part, in this case a long "Praefatio admonitoria" in which Paracelsus' doctrines of macrocosm and microcosm, signatures, and the tria prima appear in full bloom. If they are related to the remedies which follow, I am unable to detect it.

Du Chesne has been called "a thoroughgoing Paracelsian," [31] and the hermetic character and controversial tone of many of his works seem to have stamped him as the typical Paracelsian in the eyes of his adversaries. His famous *Pharmacopoea dogmaticorum restituta,* however, gives little indication of all this. As the title indicates, his object was to "restore" the Galenic pharmacy:

> Thus I hope that the most censorious, even Theon himself, will bear witness that this is not entirely new, nor ours, but in accord with the old dogmatic physicians, restored and augmented by our discoveries.[32]

According to him, "the dogmatici" are characterized by an aversion to the operations of the vulgar druggists, of which the first mentioned is distillation. This and other aspects of "the hermetic philosophy" were of interest to the ancients, but:

> Truly, I say, not absolutely, but in a relative sense: since such chemical operations as these were not yet known in that time. It was not entirely known then how to

[30] A. Dechambre et L. Lereboullet, ed., *Dictionnaire encyclopédique des sciences médicales,* Paris, 1864-89, article "Croll."

[31] Thomson, *History of Chemistry,* vol. I, p. 171.

[32] Du Chesne, *Pharmacopoea,* p. 140. The reference may be to the Alexandrian sophist, Aelius Theon.

dissolve the varieties of salts by heat, and other things similarly, and how they can finally be congealed. It was not known how from salts were drawn liquors which dissolve the most durable metals.[33]

Planis-Campy seems to be the least remembered member of this group, although he was councillor and ordinary physician to Louis XIV. His *Bouquet composé des plus belles fleurs chimiques* (1629) begins with an eulogy on medicine as an occupation for man, and proves by philological argument that "hermetic medicine" is "true medicine."[34] Medical chemistry (l'art chimique médical), which began with Adam, requires that one know the signatures of things, for, according to the doctrine of macrocosm and microcosm, man contains within himself not only plants, minerals and animals, but even the superior bodies and all the meteorological phenomena (impressions et metheores) of the ethereal region. All bodies further arise in the three principles and all illness arises from their deprivation.[35] Having made clear his principles, he proceeds in successive chapters to discuss the operations of chemistry, and its works, waters, oils, salts, pills, tablets (distablettes), theriacal antidotes and electuaries, unguents and liniments, and plasters, without reference to those principles, although he returns to them in a final chapter on "l'explication des termes chimiques." Planis-Campy might be said to have come closer than any of the others in this group to amalgamating Paracelsian theories and remedies, for he does include them in the same book.

The career of Hartmann illustrates the increasing interest in chemistry but also its continuing dependence on medicine, for he began as a teacher of chemistry, holder of the first chair in Germany, and ended as an official physician. He edited Croll's *Basilica chymica,* and tells us in his own *Praxis chymiatrica* that iatrochemical practice is useful in two respects, to better understand illness, which is known by pathology, and to have more convenient and select remedies, which is known by therapeutics. He says that in pathology he has consulted "the learned Fernelius," and in therapeutics "the books of pharmacists, principally chemical."[36] In view of this beginning, Paracelsian theories would not be expected to play a great role in the pharmacopoeia which follows, and I find no evidence that they did. The Dechambre *Dictionnaire* calls Hartmann a refined (epuré) Paracelsian.[37]

[33] *Ibid.*, pp. 150-51.
[34] Planis-Campy, *Bouquet*, pp. 1, 7.
[35] *Ibid.*, pp. 81-83, 88.
[36] *Praxis*, Prooemium, pp. 1-2.
[37] *Dictionnaire encyclopédique des sciences médicales*, article, "Hartmann."

Mayerne was the most prominent target of the mysochimiques for his advocacy of chemical medicines. After his condemnation by a famous decree instigated by the Paris medical faculty in 1603, he held a position at the court of England where he is supposed to have influenced the introduction of chemical remedies into the *Pharmacopoeia Londinensis*. His *Syntagma*, published posthumously, contains no theory, but his conformation to what appears to have been a pattern of parallel cultivation of Paracelsian theory and medical chemistry would seem to be indicated by Eloy's remark that "His practice was estimable, his theory deserves to be forgotten." [38]

Thus it appears that although these Paracelsians adhered to both medical chemistry and to Paracelsus' theories of medicine and chemistry, they kept the two remarkably distinct. We have seen that the magna opera of Dorn and Croll are sharply divided into two sections on theory and practice, so little related that they have the aspect of separate books. Severinus' book on Paracelsian theoretical medicine contains no remedies, and the pharmacopoeias of Du Chesne, Hartmann, and Mayerne contain practically no theory. Planis-Campy prefaces his pharmacopoeia with a number of disconnected observations, but having finished with the preface he abandons this subject, and in successive chapters deals with waters, oils, salts, pills, ointments, etc., with scarcely any mention of their "correspondences" or their relation to the Paracelsian "tria prima." That Paracelsus himself dealt with his remedies and his theories so independently is less likely, for he at least concerned himself with both in the same general context. Nevertheless, it is noteworthy that precedents existed for most of his chemical remedies, and in the case of his works which have been surveyed here, examples of a close interrelationship between his theories and his remedies are not easy to find.

III. The Pharmacopoeia of Medical Chemistry

No work better exemplifies the fully developed chemical pharmacopoeia —that is, the pharmacopoeia of medical chemistry on the eve of its general acceptance as a part of legitimate medicine—than Croll's *Basilica chymica*. Croll is the only "Paracelsian" who is credited with a significant number of discoveries, but seems to have drawn his remedies widely from his predecessors as well as from his own experience. His work is conveniently restrictive in not including many remedies which were not

[38] N. Eloy, *Dictionnaire historique de la médecine*, Mons, 1788, article, "Mayerne."

considered "chemical," and in most cases gives a clear account of their preparation. Croll died shortly after the appearance of the first edition, and a few remedies appear to have been added later, notably by Hartmann, who edited the edition of 1643, on which this survey is based.

Croll's *Basilica Chymica*

The following table indicates in the left hand column the remedies of *Basilica chymica*. His description of their preparation is in the right hand column. The modern names of chemical materials are given in brackets,[39] insofar as they can be identified. An analysis of the contents will follow.

I. UNIVERSALE DIGESTIVUM [to promote the suppuration of ulcers or wounds]	
1.[40] Tartarus vitriolatus [potassium sulphate] [41]	the whitest tartar, coagulated with aqua agrimoniae, which he identifies as oil of vitriol (16).[42]
II. VOMITIVUM	
2. Vomitorium conradini	based on Hellebore (24).
3. Gilla a Theophrasti seu sal vitrioli	crystals of iron or copper vitriol are "resolved" in the first distillate from vitriol distillation (25).
4. Phlegma vitrioli acidum	vitriol is distilled seven times, returning the phlegm (26).
5. Vitriolum album [zinc sulphate]	white vitriol is crystallized in rain water [it was probably obtained by leaching roasted zinc-containing ores] (27).
6. Aqua Benedicta	from crocus metallorum, macerated by grinding in water, wine, beer, or mead. His crocus metallorum is made by heating nitrum (saltpeter) and antimony,[43] [potassium antimoniate]. Quercetanus (Du Chesne) and Beguin are cited (30-32).
7. Aqua Benedicta D. Hartmanni	differs slightly from the above (34).

[39] Round brackets, (), are used for raw materials, square brackets, [], for reaction products.

[40] These numbers will be used to identify the preparations in the subsequent analysis.

[41] The bracketed identifying names in this column are those of L. Gmelin, *Handbook of Chemistry*, London, 1850.

[42] Page citation from Venice, 1643, edition of *Basilica chymica*.

[43] "Antimony" in this pharmacopoeia refers to the naturally occurring form, which was primarily antimony trisulphide.

III. CATHARTICUM RESOLUTIVUM [to promote bowel evacuation]

8. Turpethum minerale [mercuric sulphate]	"any medicament which makes a purgative from mercury. . . . Various methods for preparing the mercury have been devised by the chemists, some of which attempt to accomplish it through spirit of common salt, aquas fortes, oil of vitriol; others by itself or with flint stone (silex) over a long period of time" (45 ff.).
9. Purgatio mercurii optimi	a wine extraction of mercury.
10. Praecipitatio mercurii egregia	mercury is dissolved in nitric acid, and the solution cooled to form crystals, which are dried over a slow fire [mercuric and/or mercurous nitrates].
11. Mercurius praecipitatus solaris	based upon a mixture of two solutions, gold in aqua regia and mercury and antimony in nitric acid. He calls it the best remedy for "morbus Gallicus."
12. Aurum vitae	similar to the above.
13. Praecipitatus lutens diaphoreticum	based on mercurous chloride (calomel).
14. Mercurius praecipitatus	[mercuric oxide].
15. Mercurius gryseus	based on "common mercury precipitate, yellow or white" [hydrated or anhydrous mercuric sulphate].
16. Arcanum corallinum Paracelsi	"or non-corrosive red mercury sublimate." The process is complicated, but consists essentially of "mortifying" mercury with saltpeter and red vitriol, distilling for 24 hours and redistilling the red sublimate with saltpeter and alum, to produce a second red sublimate [mercuric oxide]. He calls it a great invention and secret of Paracelsus (66).
17. Laudanum minerale D. Hartmanni	a vinegar extract of the above (74).
18. Mercurius dulcis panchymagogon Quercetani	[mercurous chloride] produced from mercury and mercuric chloride
19. Another (aliud)	a mixture of mercury, butter of antimony, and vitriol is dissolved in nitric acid.
20. Flores butyrii antimonii	[antimony trichloride] produced from anti-

(called by the vulgar mercurius vitae)	mony and mercurous chloride (80).
21. Spiritus vitrioli philosophicus	differs from ordinary spirit of vitriol chiefly in being "elegans" (84).
22. Flores antimonii [antimony trioxide] [44]	he mentions a vulgar preparation by sublimation of antimony, and another by dissolution in salt of tartar, followed by impregnation with spirit of salt [probably antimony trioxide]. He mentions red and white flowers, made "from antimony alone," [sulphide-oxide mixtures?] for which Beguin is cited. These are converted into emetic pills by treating them with "aqua fortis ex vitriolo" (88-94).
23. Sulphur vitriolo	a mixture based on vitriol.
24. Tinctura auri	a mixture of "calx of gold" and the "above" rectified oleum florum (antimony trichloride?) (98).
25. Electuarium antimonii	a mixture of glass of antimony, gold, and silver.
26. Vitri antimonii correctio	[antimony sulphate] prepared from glass of antimony and spirit or oil of vitriol (102).
27. Panchymagogen	a mixture of antimony and vegetable ingredients (106).
28. Spiritus vitriolo purgans	a mixture of antimony, sulphuric acid, and vegetable ingredients.
29. Scammonium	the juice of the root of the herb Convolvulus Syriacus,[45] which he prepares with spirit of vitriol (120).
30. Specificum purgans Paracelsi	a mixture of ingredients after the manner of polypharmacy. But during the process "subtle spirit of wine, tartar, and vitriol ascends" (127).

IV. DIURETICUM [to promote evacuation of urine]

31. Sal succini	not identified (139). It was probably a salt of succinic acid, which Croll is supposed to have first described.[46]
32. Spiritus salis	[hydrochloric acid] prepared by distilling "like aqua fortis" a mixture of sea salt and white potter's clay (140-154).

[44] The molecular form is actually the sesquioxide (Sb_4O_6).

[45] N. Lemery, *Dictionnaire universel des drogues simples*, Paris, 1759, p. 788.

[46] H. Kopp, *Geschichte der Chemie*, 2 Bd., Braunschweig, 1843, Bd. I, p. 112; J. F. Gmelin, *Geschichte der Chemie*, 3 Bd., Göttingen, 1797, Bd. I, p. 292.

V. DIAPHORETICUM [to promote perspiration]

33. Antimonium diaphoreticum	compounded of "mercurus sublimatus per vitriolum et salem," antimony, and aqua regia (155) [this would be antimony trichloride mixed with mercury chlorides].
34. Bezoardicum	compounded of gold, butter of antimony, and an unclear mineral acid preparation (161).
35. Diaphoreticum solare Korndorfferi	gold is dissolved in "alcohol of wine" by digestion. He says if it's not strong enough, the addition of nitri spiritus or aqua regia helps (163).
36. Antimonium diaphoreticum	prepared by detonation of antimony with nitrum. He cites Beguin and Valentine (166-7) [potassium antimoniate].[47]
37. Bezoardicum minerale	compounded of butter of antimony and nitric acid (spiritus nitri). He cites Quercetanus and Sennert (168-9) [antimony pentoxide].[48]
38. Spiritus tartari	one is obtained by distilling tartar of wine "like aqua fortis," which yields a water, an oil, and a spirit (175-6). Another is compounded from cream of tartar (potassium bitartrate), spirit of wine, and vitriol (181). And another, called sulphur or tincture of tartar, is an extract of calcined tartar (potassium carbonate) by spirit of wine (184).
39. Aurum transparens	prepared by fusing gold with glass of antimony (188).
40. Panacaea sulphuris antimonii	prepared by boiilng the residue from a preparation of butter of antimony with a lye made of calx viva and "cineres clavellatis." The red powder obtained from the extract is further treated with regulus of antimony (metallic antimony) and oil of sulphur or oil of vitrol (190).

VI. CONFORTIVUM [cordial and strengthening medicines]

41. Sal margaritarum orientalium	prepared by dissolving pearls in various solvents, the first, spirit of vitriol (192-3).
42. Arcanum perlarum	prepared by dissolving pearls in "spirit of guaiac wood" (199).
43. Quinta perlarum essentia	prepared by dissolving pearls in wine vinegar (200).

[47] L. Gmelin, *Handbook of Chemistry*, London, 1850, vol. IV, p. 339.
[48] *Ibid.*, vol. IV, pp. 330, 366.

44. Sal corallorum	prepared "in the same way" (203).
45. Tinctura corallorum	prepared by dissolving coral in the strongest vinegar (acetum fortissimum), or by calcining it and extracting with spirit of wine. Beguin is cited (208-11).
46. Liquores gemmarum	prepared by burning gems with sulphur, digesting in saltpeter (sal nitri) and extracting with terebinthine (212).
47. Acetum radicatum	The second fraction from a distillation of vinegar (acetum) with terebinthine (215).
48. Oleum cinnamomi	prepared by simple distillation of cinnamon (216).
49. Elixir proprietatis Paracelsi	a distillate from myrrh, aloes, and crocus orientalis, digested with sulphuric acid prepared from sulphur (oleum sulphuris per campanum factum) (222).
50. Balsama confortantia	aromatic oils (227 ff.).

VII. ANODYNUM etc. [to ease pain or procure sleep]

51. Laudanum Paracelsi laudatissimum	a mixture of many ingredients including pearls, but not opium (232).
52. Anodynum specificum Paracelsi	a vegetable mixture (237).
53. Laudanum opiatum	based on opium (238).
54. Laudanum sine opio	iron shavings and iron or copper vitriol are extracted with vinegar. Oil of tartar (hygroscopic potassium carbonate) is added to precipitate out "sulphur vitriolatum anodynum" (241).
55. Laudanum epilepticum	based on oil of camphor (243).
56. Laudanum hystericum	based on "laudanum vitriolatum" (244).
57. Laudanum electuaricum	a mixture of many ingredients (246).

VIII. ODORIFERUM

a short section; the remedies are all of vegetable origin.

The balance of the pharmacopoeia is devoted to medicines "specific to the principal members" (head, stomach, etc.), and to remedies for plague and poison. They are largely the same as those listed above, but tend towards polypharmacy, and will not be included in this survey.

Although Croll's "Paracelsianism" is constantly emphasized by students of the history of medicine, his pharmacopoeia shows decided

development beyond Paracelsus from the point of view of modern medicine and chemistry. With Paracelsus, whose most frequently recurring remedies seem to have been derivatives of vitriol, laudanum, and tartar, we are still in the realm of the unfamiliar. Not only do we encounter such mysterious remedies as laudanum, mumia, and the quintessences, but even materials familar to us, such as vitriol, appear in the most extraordinary applications. Although by no means free of such remedies, Croll's book is primarily concerned with remedies which in many cases continued to appear in later pharmacopoeias through the nineteenth century, notably, with derivatives of mercury and antimony.

The versatility of sulphuric acid continues to manifest itself in Croll's *Basilica*, where it appears as a remedy in several different guises. Sometimes it was used directly, in forms vaguely similar to those advocated by Paracelsus (N 4, 21, 28).[49] But more often, Croll uses it for the *preparation* of remedies, as indicated by such names as vitriolated tartar (N 1), vitriolate of laudanum (N 56), and corrected glass of antimony (N 26). The transfer of interest which is implied here, from acid as a remedy, to acid as an agent for producing chemical change, is even more pronounced in the case of nitric acid, which is used in almost every example in a way which would produce a chemical reaction recognizable in modern terms (N 10, 11, 12, 16, 33, 37), and is nowhere recommended by itself as a remedy. The same is true of aqua regia (N 11, 12, 33, 35). Perhaps this decline in the use of the acids as remedies can be attributed to adverse experience, for hydrochloric acid, of which only vague indications occur in earlier writers (indications going back to the fourteenth century, however), appears as a remedy in Croll (N 32).

In *Basilica* laudanum appears to be a generic term for anodyne medicines. No two of his laudanums are more than remotely similar, but they do seem to contain nearly every category which we have seen identified as *the* laudanum, for there are laudanums containing opium (N 53), pearls (N 51), mercuric oxide (N 17), and "vitriolated sulphur anodyne" (N 54). Others of Paracelsus' favorite remedies, such as mumia and the quintessences, are not at all prominent in *Basilica*.

The most remarkable difference between the mineral remedies of Croll and those of Paracelsus is not in the minerals used, for they are largely the same, and only gold, mercury, and antimony are mentioned more than nominally. It is rather in the technique of preparation, and in the greater

[49] In this section numbers preceded by "N" refer to the numbered remedies in the summary of *Basilica chymica*, see above pp. 111-115.

degree to which these minerals dominate the pharmacopoeia of Croll. Paracelsus in *Archidoxies* prepared his quintessences through dissolution of metals in a mysterious solvent which was probably a mineral acid.[50] But since the quintessence was a distillate from the solution, and since it is not clear that he depended on them very heavily in his medicine anyway, we can scarcely credit him with an extensive exploitation of mineral acid reactivity. Croll, on the other hand, in his treatment of gold, mercury, and antimony (sulphide), very nearly exhausts the possibilities of these acids. That is to say, he seems to have prepared most of the simple compounds obtainable by direct reaction. This implies a considerable improvement in chemical technique, for if, as appears probable, he prepared the nitrates of mercury (N 10), he was utilizing an old process (the preparation of red precipitate of mercury) in such a way as to prepare an intermediate product, instead of forcing the reaction to its final conclusion, through the usual violent techniques of alchemy.

Croll's use of gold strikingly illustrates the advent of "real" chemistry as compared to the imaginary chemistry which had been so prominent heretofore in the working of this metal. Of seven prescriptions involving gold, three call for its dissolution in aqua regia (N 11, 12, 35), and the one which involves its extraction by wine or vinegar (N 35) carries a clear implication that it will not work. Intimate physical mixture is involved in the other four gold preparations (N 24, 25, 34, 39). His discussion of "Turpethum minerale" (N 8) indicates that mercury was prepared by dissolution in each of the three mineral acids, and his other mercurial prescriptions, such as that of the nitrates, which we have just noticed, show that his techniques were sufficiently advanced to enable him to prepare intermediates as well as final products. But the elaboration of his technique beyond that of our earlier sources is best shown in his treatment of antimony, for it appears that his pharmacopoeia included most of the forms known to the antimony technology of the next two centuries.

His antimony preparations fall largely into three categories, (1) the forms of the "regulus," or metallic antimony itself, (2) salts, (3) oxides and mixtures in which oxides predominate. The regulus of antimony is barely mentioned by Croll, as a raw material. Its direct medical use became popular later in some rather bizarre forms, such as the "antimony cup," in which wine was allowed to stand so as acquire emetic properties, and the "everlasting pill" which could be recovered after use. The salts

[50] See Sherlock, "The chemical work of Paracelsus," *Ambix*, vol. 3 (1948), p. 48.

include products of the dissolution of antimony sulphide or oxide in sulphuric and nitric acids and in aqua regia, that is to say, a sulphate ("vitri antimonio correctio" N 26), the pentoxide (Bezoardicum minerale) and the trichloride (butter of antimony). The oxides and oxide-sulphide mixtures, which seem to have been the most prolific group of antimony preparations (the *Nomenclature* of De Morveau mentions eleven oxides) appear in *Basilica* in several of the well known forms, the "glass" and "flowers," in which trioxide predominates, the pentoxide (Bezoardicum minerale), and the saltpeter fusion product, potassium antimoniate ("crocus metallorum" N 6; diaphoretic antimony N 36). The oxichloride, "powder of Algaroth," does not appear, nor do the forms in which sulphides predominate, such as "golden sulphur," "liver" and "Kermes." Until the early nineteenth century the congenital impurity of the antimony ore used, and the failure of the oxidation, which was usually the first step in antimony preparation, to effect a complete conversion of the sulphide, led to a very exaggerated conception of the variety of forms of antimony. Croll also appears not to mention that antimony compound which is the most prominent in the modern pharmacopoeia, the tartrate (tartar emetic), although his contemporary Johann Thölde (Basil Valentine) is supposed to have known it.

The technical development of chemical preparation is even better illustrated here than in the case of mercury, for there are a number of secondary compounds, that is, compounds prepared from raw materials which had themselves been chemically prepared. Examples of this are antimony trioxide, prepared by successively reacting salt of tartar (potassium carbonate) and hydrochloric acid with antimony sulphide (N 22), and antimony pentoxide, prepared by reacting mercuric choride and nitric acid, successively, with the same raw material (N 20. 37).

Croll makes no claim to having discovered these remedies, although he is thought to have first mentioned some of them.[51] Jean Beguin, whom he cites most frequently in connection with antimony, was not a Paracelsian, but a representative of a new "school" of chemistry, the adherents of which seem to have been interested in chemistry for its own sake. Paracelsus is not cited in this connection, and the celebrated Basil Valentine (Johann Thölde) [52] only once. But the renown of the latter's

[51] J. F. Gmelin seems to credit him with the first mention of some antimony preparations for which Croll himself cites prior authority, diaphoretic antimony (N 36) and Bezoardicum minerale (N 37). (*Geschichte der Chemie*, Bd. I, pp. 290-92). A confusion of names may be involved here.

[52] The view that Johann Thölde produced, in the first decade of the seventeenth cen-

celebrated *Triumphwagen Antimonii* (Triumphal chariot of antimony), which appeared in 1604,[53] requires us to take some notice of its treatment of antimony. Its preparations are considerably less clearly described than those of Croll, and the element of conjecture in their identification is greater.[54] Among the oxides, he seems to have prepared all of those mentioned by Croll, including the nitric acid dissolution product, antimony pentoxide.[55] He also utilizes sulphuric and hydrochloric acids, but does not clearly describe the products, although it seems probable that they would be the same as those prepared by Croll.[56] He is supposed to have known tartar emetic, and the *Triumphal Chariot* contains some processes which might have yielded that product.[57] It seems possible, therefore, that all of the antimony derivatives mentioned by Croll are also described in this book. But in view of Croll's liberal citation of other sources it seems improbable that his knowledge of antimony was based upon Valentine.

There are many other indications that antimony technology was largely developed before the time of Croll or the *Triumphal Chariot*. As early as 1566 the parliament of Paris passed a decree against the use of antimony, and in 1582 we find a decree of the senate of Augsburg, requiring that dangerous preparations, such as, "Labdanum minerale, called antimony, Turpetum minerale, and other mercurial purgative medicine," [58] should only be prepared by the authority of a physician. Opposed to the

tury, the works attributed to Valentine, is now generally accepted. Thölde was supposed to have found the originals of the works under the high altar at Erfurt, or in a column of the dome, which was struck by lightning. Later he was considered a gullible compiler of various post-Paracelsian works, rather than a forger. (See E. O. von Lippmann, *Entstehung und Ausbreitung der Alchemie*, Bd. II, Berlin, 1931, pp. 53-4)

[53] Leipzig, 1504. I have used the English translation of E. Waite, *The Triumphal Chariot of Antimony*, London, 1893 (hereinafter cited as Valentine, *Triumphal Chariot*).

[54] A review in the *Philosophical Transactions*, of Theod. Kerckringius, M. D., *Commentarium in Currum triumphalem antimonii*, Amstelodami, 1671, states: "The learned physician [Kerckringius] assureth the reader in the preface of this book, that having carefully perused the antimonical treatise of Valentine, he tried all the particulars, ordered therein to be done; but that in the performance thereof he erred frequently, and was great expense without success, yet not by any default of the author, but always his own; esteeming this Basil to be the best, the sincerest, and the clearest of all the chemists he knoweth. . . ." *Philosophical Transactions of the Royal Society of London*, vol. VI (1671), p. 2162.

[55] Valentine, *Triumphal Chariot*, pp. 93-6, 119-21.

[56] *Ibid.*, pp. 121, 135.

[57] *Ibid.*, pp. 142, 176.

[58] Quoted in Darmstaedter, "Paracelsus und die Einführung chemischer Präparate als Heilmittel," *Historische Studien* (Festgabe Georg Sticker), Berlin, 1930, p. 68.

"physician" here are "empirici" and "chymici populares." These indications of earlier widespread use of antimony, and the mention of "Labdanum" (laudanum ?), raises again the question of Paracelsus' involvement in antimony technology. But such evidence as I have found points more to the empirici.

IV. The Rationale of Mercury-Antimony Pharmacology

Although antimony (sulphide) and mercury (both cinnabar and metallic mercury) appeared in the materia medica of Dioscorides, their appearance as an important part of the pharmacopoeia of Europe is associated with that mysterious personage Constantinus Africanus. In his *Liber de gradibus* (eleventh century) he recommended an unguent containing mercury for skin diseases ("ad curandum scabiem et pustulas"), and he is credited with having coined the name antimony for the ancient stimmi, which we now recognize as the trisulphide of antimony.[59] This type of medical application of mercury became a matter of great importance when its efficacy in the treatment of syphilis was discovered at the end of the fifteenth century. Both Dioscorides and Constantinus specify external uses of antimony. John of Rupescissa, our earliest source for a "prepared" antimony, does not state clearly his use for it, but the prescription given by him, a vinegar extract, does correspond to the type of preparation used in later times as an emetic, and this was to be its chief medical application.

From these limited beginnings to the comprehensive medical application of mercury and antimony which we find in Croll is a considerable development, and in the case of mercury that development rests on a somewhat different basis from its original use. Both mercury and antimony are powerful poisons, but in minute doses are merely irritants, and through judicious internal administration can be made to perform a number of the most essential functions of therapy, as it was understood in this period. Adjustment of the "humours" by evacuation was one of the chief practices of Galenic medicine, and, whatever they thought about the doctrine of the humours, the proponents of medical chemistry continued to rely extensively on evacuation. This is indicated by the

[59] Paul Richter, "Ueber die Entstehung und Entwicklung der Quecksilberschmierkur bei der Syphilis," *Medizinische Klinik*, No. 9, vol. 10 (1908), p. 4; M. L. Dufrenoy, "The significance of antimony in the history of chemistry," *Journal of Chemical Education*, vol. 27 (1950), pp. 595-97. The relevant passages are in Constantinus Africanus, *Opera*, Basiliae, 1536, pp. 381-2.

classification of most of Croll's remedies under the headings of vomitives, cathartics, diuretics, and diaphoretics, and by Hartmann in his *Praxis chymiatrica*:

> Since nature is ordinarily accustomed to expell the menaces of illness in four ways, through the mouth, through the bowel, through the urinary bladder, or through the surface of the body, the physician imitates nature in this and constitutes four classes of evacuative medicines. They are vomitives, purgatives, diuretics, and diaphoretics.[60]

The use of mercury as a cathartic (or purgative), which is still considered medically legitimate, accounts for all of the mercurial remedies in Croll's *Basilica* (although one remedy (N 11) is also recommended for venereal disease). Antimony is similarly found only in what are recognized as its legitimate uses, as a vomitive (emetic), cathartic, and diaphoretic. The remedies involving these two materials constitute the major part of his pharmacopoeia, so it can be seen that, notwithstanding the fanciful nature of some of his remedies, we are no longer dealing with remedies which are for the most part inexplicable in terms of modern medicine.

The problem of mercury therapy was essentially one of dosage, both in its use as a cathartic and in that special use it acquired in connection with the cure of venereal disease. For the efficacy of any mercury preparation depends chiefly upon its conversion into a soluble mercuric salt. The long known corrosive sublimate possessed this efficacy to a fatal degree, and the development of the various other mercury preparations was a matter of producing forms of mercury which possessed just the right concentration of a soluble mercuric salt, or which reacted within the body in such a way as to produce such a salt. The method by which this end was sought seems to have been more or less indiscriminate experimentation with mixtures containing mercury or its compounds in various proportions, or with the chemical preparation of mercury. Since the activity of the alchemists had resulted in the preparation of several mercury compounds, notably mercuric oxide (mercury precipitate), mercuric and possibly mercurous chlorides[61] (corrosive sublimate and calomel), the practitioner of medical chemistry had ready at hand the raw materials for considerable experimentation. In fact, in mercuric chloride he had what is still therapeutically the most important mercury

[60] Prooemium, p. 2.

[61] G. Urdang has found that mercurous chloride (calomel) is apparently not mentioned before Beguin and Croll ("The early chemical and pharmaceutical history of calomel," *Chymia*, vol. I (1948), pp. 93-108).

salt. In modern medicine the desired remedy is obtained by reducing the concentration of this substance in the dosage. It could not be expected that an age so little acquainted with the chemistry of mercury should be content with this simple procedure, indeed, until it had been tried it could not be known that no better way of administering mercury was available. The great interest which this pursuit aroused is attested by the notoriety of Paracelsus' supposed mercury remedy, mercurius praecipitatus (mercuric oxide). This substance possessed the desirable quality of yielding a small amount of soluble mercuric salt when given as medicine, and so constituted a valuable contribution to the pharmacopoeia. Croll gives us what appears to be this substance, under the name of "arcanum corallinum Paracelsi" (N 16), calling it one of Paracelsus' great inventions and secrets.[62] Perhaps the virtue of this "arcanum corallinum Paracelsi" was that it was, as he conceived that the ideal medicine should be, a "spirit," that is a distillate or sublimate. This would have given it a prestige which the same substance could not have enjoyed when prepared as a precipitate, not to mention that form of it which was scarcely prepared at all, the product of oxidation of mercury by air.[63] The works of Paracelsus which I have used do not indicate that he prepared mercuric oxide in this way, nor do the secondary works on his medicine indicate that he referred to it as "arcanum corallinum." May this be, like opiate laudanum, a case of a later development being ascribed to him?

The case is similar with antimony therapy, as suggested by the principle of the antimony cup. It had no such overriding application as the use of mercury in venereal disease, but had a wider range of general medical use. From the variety of chemical preparations of antimony and the amount of controversy generated over its use, we may judge that its applicability was supposed to be very great.[64] The numerous decrees

[62] Paracelsus' process for producing "mercurius praecipitatus" is also found in the Geber corpus (*De inventione veritatis*, ch. X, in *The Works of Geber*, ed. Holmyard, London, 1928, p. 211). The same substance was later prepared by direct oxidation of mercury, and called "mercurius praecipitatus per se." Kopp regarded an obscure passage in Geber's *Summa perfectionis magisterii* as a description of this preparation (*Geschichte der Chemie*, Leipzig, 1931, Bd. IV, p. 182. Compare with *The Works of Geber*, ed. Holmyard, pp. 110-11). Ruska finds the same process in an equally obscure passage in the pre-Geberian *De aluminibus et salibus* (*Das Buch der Alaune und Salze*, Berlin, 1935, p. 91).

[63] Some of the inorganic oxides, although not those of mercury, were standard ingredients of the Galenic pharmacopoeia. It appears that oxides found naturally or obtained by atmospheric oxidation were not regarded as "chemically prepared."

[64] It has been suggested that the physiological action of some of these remedies may

against it, on the other hand, may give an exaggerated impression of its use, for it clearly became the cause célèbre in the controversy over the internal use of chemical medicines.

V. The Introduction of Medical Chemistry into the Standard Pharmacopoeias

In view of the fact that the author of one of the first and most influential standard (Galenic) pharmacopoeias, Valerius Cordus, was also responsible for an important treatise on the derivatives of vitriol, which lay at the root of medical chemistry, it is evident that the isolation of traditional medicine from the new school was never complete. Nevertheless, over a century elapsed between the appearance of Cordus' *Pharmacorum conficiendorum ratio* (1546), which contained no chemical remedies, and the definitive integration, in 1684, of these remedies into the standard pharmacopoeia which took its descent from Cordus' work, the *Pharmacopoeia Augustana*. The intermediate steps in this development are apparent from the following table:[65]

1546 *Pharmacorum conficiendorum ratio* (Cordus)

Contained no chemical remedies.

1564 *Pharmacopoeia Augustana,* 1st ed.

Listed nitric acid under "Decocta" (medicines made by boiling in a watery fluid), and corrosive sublimate, as "aqua cum mercurio."

1573 *Pharmacopoeia Augustana,* 2nd ed.

Listed two dozen "oleo aromatica," including oils from antimony (stibium), "nitrum," and sulphur.

1585 proposed *Pharmacopoeia Londinensis* (not published)

Included chapters on extracts, salts, chemicals (chemica), and metals.

1588 Antwerp pharmacopoeia, based upon Cordus' *Pharm. confic. rat.*

Included a chapter on distillation and extraction, by Gesner.

have been due to the presence of arsenic as an impurity. (H. Erdmann, *Lehrbuch der anorganischen Chemie*, Braunschweig, 1902, p. 375).

[65] Compiled from the following works:

1) Theodore Husemann, ed., *Pharmacopoeia Augustana*, facsimile of the first edition, Madison, Wis., 1921, Introduction, pp. ix-xxxvii.

2) George Urdang, ed., *Pharmacopoeia Londinensis*, facsimile of the first edition, Madison, Wis., 1944, Introduction, pp. 13-60.

3) E. Darmstaedter, "Paracelsus und die Einführung chemischer Präparate als Heilmittel." *Historische Studien* (Festgabe Georg Sticker), Berlin, 1930, pp. 63-73.

1597 *Pharmacopoeia Augustana*

Same as the 1573 ed.

1613 *Pharmacopoeia Augustana* (the first of three editions under the editorship of Raymond Minderer)

Included new remedies in *both* Galenic and chemical medicine, among the latter, flowers and glass of antimony, diaphoretic antimony (potassium antimoniate-Croll), turbethum minerale (any mercury purgative-Croll), and six inorganic salts. It also gives an antidote for nitric acid poisoning. It recommends the pharmacopoeias of Croll and Quercetanus (Du Chesne).

1618 *Pharmacopoeia Londinensis,* 1st ed. (Mayerne participated in its preparation)

Included chemical remedies in a separate section, among them, "crocus metallorum" (antimony trisulphide and sulphur), "mercurius dulcis" (mercuric nitrate), mercurius vitae, turbeth minerale (mercuric sulphate), vitriolated tartar and glass of antimony.[66]

1640 *Pharmacopoeia Augustana*

Appended a "Mantissa Hermetica" of 25 folio pages, containing sections on simple and composite spirits, elixirs, essences, tinctures, distilled oils, balsams, magisteries, salts, flowers, crocuses, etc. It also described the production of sulphuric acid by burning sulphur and hydrochloric acid by heating together common salt and clay.

1684 *Pharmacopoeia Augustana*

Incorporated the above "Mantissa Hermetica" without qualification as a definitive section.

From these brief notices of the progressive acceptance of the remedies of medical chemistry by the medical profession certain observations can be made. With the possible exception of the six unidentified inorganic salts in the *Pharmacopoeia Augustana* of 1613, there is no indication of any remedies which we have not encountered in the works on which this study is based. Among the favored remedies the mineral acids do not appear to have been less prominent than they were in the works of our "chemical physicians," for nitric acid is the first remedy mentioned in

[66] These remedies are identified according to Urdang, *Pharmacopoeia Londinensis*, Introduction, pp. 59-60. They differ somewhat from the remedies given by Croll under these names, but do not represent any preparations unknown to Croll.

connection with an official pharmacopoeia (*Pharmacopoeia Augustana* of 1564), and the same pharmacopoeia, in its edition of 1640, incorporates what we have seen to be the least prominent mineral acids, hydrochloric, and sulphuric prepared by burning sulphur. Raymond Minderer, the editor of three early seventeenth century editions of *Pharmacopoeia Augustana*, was himself the author of a treatise on the virtues of the derivatives of vitriol (*De calcantho seu vitriolo,* Augustae Vindelicorum, 1617). In addition to illustrating the gradual assumption of chemical remedies into the official pharmacopoeia, therefore, these indications constitute a confirmation of our conclusion as to the identity of the important chemical remedies. The removal of the distinction between chemical and traditional remedies, which occurred in the second half of the seventeenth century, can be taken as the termination of the period when medical chemistry could be said to exist as an independent school of pharmacology.

VI. Conclusion

Medical chemistry, which, in the middle of the sixteenth century, was still a matter of ill-defined distillates and occult specifics, seems to have come of age during the half century thereafter, for in Croll's *Basilica chymica* and other contemporary works we encounter many of the chemical medicines which were to play so great a role in the medicine of the next two centuries. Four mineral materials, vitriol, mercury, antimony, and gold, dominate the pharmacopoeia of Croll, but it was not the utilization of these minerals that distinguished his book, for they appear to have been the most highly regarded materials of the medical chemist as early as the middle fourteenth century. It was rather the fact that in the work of Croll and in those of his contemporaries we find for the first time a real *chemical* procedure in the production of medicines derived from these minerals. This procedure consisted in general in their dissolution in the several mineral acids, followed by recovery of the inorganic salts prepared.

The definition of the series of chemical products yielded by these procedures, and their successful introduction into the pharmacopoeias of Europe, was accomplished by the physician-chemists known as "the Paracelsians." The works of these men show that the appellation was no misnomer, for with few if any exceptions they exhibit an enthusiastic adherence to the doctrines of Paracelsus. But their association with the remedies of Paracelsus is by no means so clear, despite the existence of

evidence that it was his alleged cures which first attracted their interest. No one presented better examples than he did of the ill-defined distillates and occult specifics from which their pharmacology was to escape. Whereas their chief interest lay in vitriol, antimony, mercury, and gold, his appears to have been in laudanum, tartar, vitriol, and other even less tangible drugs. Moreover, although the material of most common interest, vitriol, was chiefly used by both Paracelsus and the Paracelsians in the acid form of "spirit of vitriol," Paracelsus usually used it as a medicine per se while his followers usually used it as a reactant for the preparation of mineral remedies. Even when Paracelsus did use a mineral acid as a reactant he commonly distilled the resulting solution, taking the distillate instead of the residue as his product. This difference in the handling of the acids is indeed the fundamental difference between the chemistry of Paracelsus and the Paracelsians.

But while it appears that it might be possible to show the development of chemical remedies from John of Rupescissa to Croll without bringing Paracelsus into the picture at all, the fact remains that it was "the Paracelsians" who brought off the definitive development, and who made medical chemistry an integral part of medicine. It may be that an exhaustive study of Paracelsus' pharmacopoeia would show that his involvement in the development of medical chemistry was greater than has been shown here, or that such involvement can be attributed to his lost works or oral teaching. This appears doubtful, however, since the references to his pharmacology which we find in the writers of the first generations after him agree in general with the picture which we get from his surviving works. Paracelsus' contribution to the pharmacopoeia of medical chemistry appears to have been primarily that of a publicist rather than that of a "founding father."

JOSIAH WEDGWOOD, MEDALLIONS, AND PHYSICIANS*

HENRY H. FERTIG

The name of Josiah Wedgwood, the famous English potter, is very familiar to art collectors and connoisseurs. It is not so well known among scientists and physicians even though he made several important scientific contributions, was intimately associated with a few outstanding physicians of his time and produced some ceramic ware that is of particular value and interest to the medical profession.

He is undoubtedly best known today in certain circles for his jasper ware, a product of his own genius, but his fame and fortune were made by his development of the cream colored earthenware known as "Queen's Ware." Jasper was a pure, white, hard stoneware body that could take a high firing and could be stained various shades of blue and green, lilac or black by the addition of various oxides. This white body was also pressed into plaster moulds, then removed and "sprigged" or embossed onto a colored ground. Products of this type are most commonly thought of as "Wedgwood," though he produced many different kinds of pottery for a multitude of uses.

Josiah Wedgwood was baptized in the Burslem Church, Staffordshire, on July 12, 1730. He was the thirteenth child and destined to be the fifth generation of potters in his family. When he was nine years old, his father died and he had to quit school and work as a potter in the factory of his oldest brother Thomas. At the age of eleven, he developed smallpox which affected his right knee and produced some fixation of the joint. His disability was to give him trouble intermittently for many years till his leg was removed in 1768. At the age of fifteen he was apprenticed to his brother for a term of five years. In 1752, he entered into a not-too-successful partnership with Harrison and Alders for two years, then a fruitful one with Whieldon, an excellent potter, for five years and in 1759 hired from his uncles a factory of his own. Because of his skill, artistry, and business acumen, his fame and needs grew and he found it necessary to enlarge and move his plant a few times till, in 1766, he purchased 380 acres and built his famous Etruria works. It was here that he invented his jasper ware in 1774. Many types of articles were

* Read at the twenty-sixth annual meeting of the American Association of the History of Medicine, Columbus, Ohio, April 12, 1953.

made in this new medium, including cameos, intaglios, plaques, beads, buttons, various kinds of tableware, figurines, candlesticks, ewers, jugs, flower holders, vases, medallions, etc.

Wedgwood used models and designs taken from many different sources. The portrait medallions were usually adapted from medals, coins, paintings, engraved portraits, and gems. Some were especially modeled in wax from life by his two principal modelers, Hackwood and Flaxman, and others. William Hackwood was the chief modeler from about 1769 to 1832. He is most famous for his portrait medallions. John Flaxman, Jr. began work about 1775 and, though he made many laudable portraits, he is most famous for his classical subjects. Not infrequently it is impossible to attribute a work to a certain artist. This difficulty occurred because Wedgwood frowned upon the practice of artists signing their works. Even where the artist is known, the medallions reflect Wedgwood's conception because he often requested that changes be made or else he made them himself.

The majority of the medallions are in white jasper on a blue ground, though there are a few that are all white or have a lilac, green, or black ground. Those made entirely of black basalt are also rather common. In size, they vary from 1¾″ x 2″ up to 14″ x 18″ though most of them are small ovals. They are smooth with clearcut reliefs. As a rule, the portraits were cut in profile. A few, however, are full face and their clarity is striking.

In Wedgwood's sixth catalogue, the portraits are grouped in seven classes. Those of Class X, listed as the " Heads of Illustrious Moderns," represent the more famous figures from the time of Chaucer (1400) to the end of Wedgwood's life in 1795. The potter probably was indebted to James Tassie, an independent artist who executed some moulds for Wedgwood, for the idea of making in jasper ware the portraits of these illustrious men and women of his age. They include princes, statesmen, philosophers, poets, painters, and various eminent men and women. In this group are listed ten physicians, but actually medallions of about twenty-five physicians were produced since many were not classed as physicians but were listed under other categories.

Wedgwood was a dynamic person, observant, had a keen interest in most scientific subjects, and was a practical thrower and an expert modeler himself. He had a large circle of friends and acquaintances which grew steadily by virtue of his visits as a guest to the Lunar Society of Birmingham on several occassions, and as a result of his many business

contacts. The medallions of people he knew take on added significance because we may be fairly certain that they received the approval of his very critical eye and represent a true likeness of the subject.

It would be difficult, if not impossible, to find an example of each of the original medallions in any one collection. Fortunately many of these old moulds were stored in the warehouse at Etruria though a number have since been lost. The pictures to be shown here are photographs of presses from the original moulds made by Wedgwood's famous modelers. They show the medallions of all those actually classified as physicians by Wedgwood.

Sir Hans Sloane (Fig. 1) was born in 1660. He studied medicine at Paris and Montpellier. He graduated M. D. at the University of Orange in July, 1683, and was elected F. R. S. in 1685. He met and liked Thomas Sydenham to such an extent that he went to live in his home for a time. Following his election as a Fellow of the College of Physicians he went to Jamaica for over a year, made many valuable natural history observations and collections and returned to London in 1689. He was created M. D. at Oxford in 1701 and was chosen president of the Royal Society in 1727. After an illness of only three days, he died in 1753 when Wedgwood was still a young man. His portrait medallion is from a cast of an ivory carving sent to Josiah Wedgwood by Samuel More in 1778.

Richard Mead (Fig. 2), the famous bibliophile and patron of the arts, was born in 1673. After a thorough classical education, he studied medicine at Utrecht and obtained his doctor's degree at Padua. He was an extremely successful practitioner, yet found time to write among others his *Discourse on the Smallpox and Measles* which included a translation of Rhazes' monograph on these diseases from the only extant Arabic manuscript, obtained from his friend Boerhaave. He died in 1754 when Wedgwood was twenty-four years old. A beautiful full face medallion was made by Wedgwood in 1778. This portrait was also obtained from a cast of an ivory carving sent to Wedgwood by Samuel More. It is unfortunate that the finished medallion could not have the benefit of the authority imparted by Wedgwood's personal acquaintance with this interesting physician, scholar, and collector.

Henry Pemberton (Fig. 3), a physician and mathematician, was born in London in 1694. He journeyed to Leyden in 1714 to study under Boerhaave, went on to Paris to study anatomy and, after a brief visit to London, returned to Leyden in 1719 as the guest of Boerhaave and

Fig. 1. Sir Hans Sloane

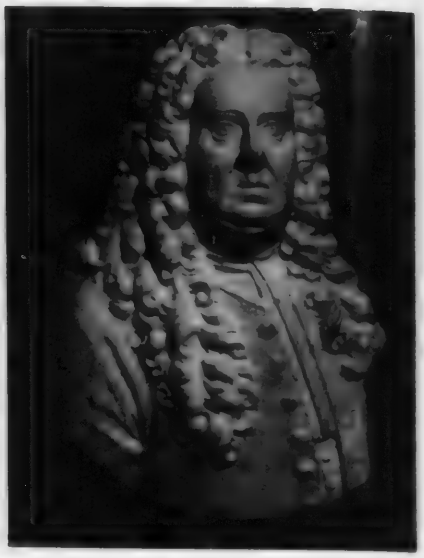

Fig. 2. Richard Mead

Fig. 3. Henry Pemberton

Fig. 4. John Fothergill

obtained his M. D. degree in December of that year. He settled in London but practiced little because of poor health. Pemberton was a good friend of Sir Isaac Newton and superintended the third edition of the "Principia." He was also a good friend of Mead and succeeded Dr. Woodward as Gresham Professor of Physic in 1728. He prepared the fifth "London Pharmacopoeia" from the years 1739 to 1746 and himself performed all the chemical and pharmaceutical experiments. He died in 1771. Although he was a contemporary of Wedgwood, they probably were not acquainted with one another, and his portrait was a cast from one of More's ivory carvings sent to Wedgwood in 1778.

The Quaker friend of Ben Franklin, JOHN FOTHERGILL (Fig. 4), was born in Yorkshire in 1712. He studied medicine at Edinburgh under Monroe, and after his graduation in 1736 went to London and soon developed a large practice. Botany was one of his chief interests, and he formed a huge garden of exotic plants and trees from the world over. It is believed that his charities amounted to about £ 200,000, a staggering sum at that time. He died in 1780 at the age of 68.

There is a vast correspondence between Fothergill and Wedgwood because the famous doctor was greatly interested in all scientific subjects and gave Wedgwood valuable advice on foreign clays. He felt that, unless the imported clays were used only in the manufacture of highly-prized porcelain, the difficulties and expense would be too great to be financially feasible. He also suggested to Wedgwood the application of a copper glaze to his products. This resulted in the production of the beautiful gold bronze ware. Wedgwood made two separate medallions of Fothergill prior to 1787. One, reproduced here, was modeled by Patience Wright and the other by John Flaxman. It is a finely-cut portrait and, as you can see, it is remarkable in its detail.

WILLIAM BUCHAN (Fig. 5), born in 1729, one year before Wedgwood, had early leanings toward medicine. Even though sent to Edinburgh to study divinity, he soon gave this up in favor of the healing art. He remained there nine years and then began the practice of medicine in Yorkshire. After practicing in several other places, he returned to Edinburgh in 1766. He began to lecture on natural philosophy and in 1769, published his *Domestic Medicine; or The Family Physician,* the first home medical advisor in England. It was a huge success, was translated into many languages, and became just as popular in many foreign countries. In 1778, he moved to London where he became well

known and developed a huge practice. Wedgwood issued a fine, large medallion of Buchan which was made from a wax model executed by Flaxman. The artist was paid £ 2-2-0 for the model in 1783. Buchan died in 1805 with less than a fortune because of his compassionate nature and his wide circle of poor, literary coffee-house friends.

The great Dutch clinician and teacher, HERMANN BOERHAAVE (Fig. 6), was born in 1668. Since he was the leading practitioner of his time his fame had spread throughout the world by virtue of his many famous pupils and his works on chemistry and physiology. Even though he died in 1738, only eight years after Wedgwood was born, it is not surprising to find that he was the subject of a beautiful full face medallion. This portrait exemplifies the fine detail and the "seeing" eyes which have contributed to the life-like appearance of these medallions. It was modeled by John Flaxman and made by Wedgwood in 1785.

The "Favorite Aesculapius" and intimate friend of the Wedgwood family was ERASMUS DARWIN (Fig. 7). He was probably consulted by Wedgwood relative to a recent illness soon after he settled in Lichfield in 1756. Darwin was one year Wedgwood's junior, and the two soon became close and lifelong friends and frequently gave each other aid, suggestions, and advice regarding their individual experiments. Darwin treated all the members of the Wedgwood household and saw them through several crises over the ensuing years. His skill as a poet locally rivaled his reputation as a physician and he competed with his townsman, Dr. Johnson, as a conversationalist, though without the latter's tenderness. Wedgwood made a beautiful full face bas-relief medallion of Darwin but the modeler cannot be identified. It is reported to have been modeled by Joachim Smith in 1774 and also by John Flaxman a year later, but the portrait has all the features of the skill of William Hackwood. It supposedly was issued in 1774, but it was first mentioned in an Oven Book of 1780. It is at times mistaken for a portrait of Dr. Johnson whom it resembles. Darwin outlived his good friend seven years and died in 1802. Both Erasmus Darwin and Josiah Wedgwood were the grandfathers of Charles Darwin.

GERHARDT VAN SWIETEN (Fig. 8), was born in 1700 and received his degree at Leyden in 1725. Although he received a call to London at an annual salary of £ 1,000, he remained at Leyden as a physician and private teacher. It was in 1745 that he was induced to go to Vienna as physician-in-ordinary to the Empress and to revamp the medical depart-

Fig. 5. William Buchan

Fig. 6. Hermann Boerhaave

Fig. 7. Erasmus Darwin

Fig. 8. Gerhardt van Swieten

ment of the University of Vienna. He remained there till his death in 1772. He never met Wedgwood, but his fame spread to England and his medallion was listed in Wedgwood's fourth catalogue of 1777. There is no information as regards the modeler.

We are fortunate in having two medallions of the famous English physician and medical historian, Dr. John Freind (Fig. 9). Born in 1675, well educated in the humanities and in medicine, Freind was an intellectual light of considerable prominence in his time. He was a close friend of Richard Mead and became physician to Queen Caroline in 1727.

Fig. 9. John Freind

Fig. 10. Albrecht von Haller

He died prematurely at the age of 53, two years before Wedgwood's birth. The two profile medallions of Freind are somewhat similar though the detail and workmanship on the labeled medallion (which alone is reproduced here) are superior. No modelers have been traced.

In Bern, Switzerland, in 1708 was born one of the greatest physiologists of all time. Albrecht von Haller (Fig. 10), poetically inclined and precocious, received inspired instruction under Boerhaave and Albinus at Leyden and his doctor of medicine degree there in 1727. In the same year he went to London for further medical training, visited hospitals and museums and attended operations and post mortem examinations. Here he made the acquaintance of Sir Hans Sloane, Cheselden, Pringle, and others. This sojourn, however, took place three years before Wedg-

wood's birth. After a short stay at Oxford he proceeded to Paris, Basel, and several of the Swiss cantons. In 1736 he became professor of medicine, anatomy, botany, and surgery in the newly instituted university of Göttingen. He resigned in 1753, returned to Switzerland, and, after several years of ill health, died in 1777. The fourth catalogue of Wedgwood appeared in this same year and in it was advertised a medallion of Haller. The modeler has not been determined.

The preceding medallions cover the group listed as physicians. The following sketches refer to those physicians whose names were included in the catalogue as philosophers, naturalists, etc.

JOHN WOODWARD was born in Derbyshire in 1665. He received instruction in medical practice from Dr. Peter Barwick who was physician to Charles II, was made an M. D. in 1695, and a fellow of the College of Physicians in 1703. He published several papers on geology and botany. His one medical contribution, in which he critized the work of John Freind, caused much strife and bitter feelings. He died in 1728, two years before the birth of Wedgwood, and was buried in Westminster Abbey. His portrait medallon, made from a cast of an ivory carving by Samuel More, was issued in 1778. Since this was fifty years after his death, we can perhaps assume that he had achieved a certain reputation, even if he had the misfortune usually to do so by innocently antagonizing his colleagues.

The Scottish chemist and physicist, JOSEPH BLACK, was born in 1728 at Bordeaux. He went to Glasgow in 1746 to study medicine and there came under the tutelage of William Cullen, who stimulated in him an interest in chemistry. The results of his investigations on magnesia, quicklime, and other alkalis were presented by him in a thesis for the doctor's degree in 1754. In 1756 Black succeeded Cullen in the chair of chemistry at Glasgow, was appointed Professor of Anatomy and then of Medicine. Concurrently, he was building a large practice in medicine and carrying out his studies on heat. He became well known as a chemist, formulated his doctrines on latent and specific heat, and in 1766 succeeded Cullen in the chair of chemistry at Edinburgh. Black died in Edinburgh in 1799. In view of Wedgwood's scientific interest and his concern with the problems of firing his wares, it is almost certain that he was cognizant of Black's findings. It is not surprising, therefore, that Wedgwood should have made a medallion of his fellow scientist in 1788. It is known that this portrait was supplied to Wedgwood by Tassie as it bears on the

truncation of the shoulder the inscription—Joseph Black, M. D. 1788. Tassie, F. The original wax model of this portrait was acquired by the Wedgwood firm in a private collection purchased a little over two years ago.

Sir Edward Hulse, born in 1682, joined the College of Physicians at London in 1717 after receiving his M. D. degree at Emmanuel College, Cambridge the same year. He developed one of the leading practices in London as did his contemporaries, Mead and Sloane. His friendship with Freind was marred by some professional differences. He was first physician to George II and was made a baronet in 1739. Following his retirement, he suffered delusions of poverty and died in April, 1759. The date of issue and the artist of Wedgwood's medallion of him are unknown.

At the age of thirty-four, Sir George Baker received his M. D. and was elected a Fellow of the College of Physicians the following year, 1757. He settled in London in 1761 and became physician to the king and queen. A man of great learning and wisdom, he was elected president of the College of Physicians nine times between 1785 and 1795, wrote Latin prose and epigrams, and was deeply interested in literature. Baker, who died in 1809, is remembered chiefly for his *Essay Concerning the Cause of the Endemial Colic of Devonshire*, read before the College in 1767, in which he showed that the Devonshire colic was in reality lead colic. In a subsequent essay, he pointed out that lead poisoning might occur from the glaze of earthen ware and Wedgwood realized this possibility. A portrait medallion of Baker was advertised in the second catalogue of Wedgwood which appeared in 1774. The modeler has not been traced.

The learned Dutch artist-physician, Pieter Camper, was born at Leyden in 1722. He graduated in philosophy and medicine at the University of Leyden in 1746, was appointed to the professorship of philosophy, medicine, and surgery at Franeker in 1750, to the chair of anatomy and surgery at the Athenaeum in Amsterdam in 1755, and to the professorship of medicine, surgery, and anatomy at Groningen in 1763. He visited England in 1748 when he remained there for more than a year, and again in 1752. He was also in London in 1785 and in Oxford in 1786. Camper, who died at the Hague in 1789, is reported to have been a visitor to the Lunar Society but there is no information as to whether he ever met Wedgwood. A portrait medallion was issued, but the modeler and date are unknown.

DANIEL SOLANDER, born in 1736 in Sweden, was the first librarian of the famous naturalist Sir Joseph Banks and was his companion during his voyages for scientific discovery. Solander studied at the University of Upsala, apparently took his M. D. degree and became a pupil of Linnaeus who recommended that he go to England. He did so in 1760 and secured a position with the British Museum. Seven years later he met Banks, a friend of Wedgwood, who was himself the subject of a portrait medallion, and remained with him for the rest of his life. He was a visitor to the Lunar Society and lived in Soho Square near the London showrooms of Wedgwood. The potter may have known him, but this is not certain. The portrait medallion, modeled by Flaxman, was made by Wedgwood in 1777.

GEORGE FORDYCE was born at Aberdeen in 1736. He received his medical education from his uncle and as a student at the University of Edinburgh. A favorite pupil of Cullen, he had a fondness for chemistry, materia medica, and practical medicine. He received his M. D. in 1758, and in 1759 went to Leyden where he studied anatomy under Albinus. He returned to London the same year and over the next several years offered lectures on chemistry, materia medica, and the practice of physic. In 1776, he was made a Fellow of the Royal Society and in 1787 a Fellow of the College of Physicians. He had an important part in the compilation of the new *Pharmacopoeia Londinensis*, which was issued in 1788. Fordyce is best known for his *Treatise on the Digestion of Food* and the dissertations on fever. He died in May, 1802. His portrait medallion was first listed in Wedgwood's sixth catalogue which was issued in 1787. It was probably modeled by Keating, one of Wedgwood's artists who also made the engraving from the portrait of Dr. Fordyce painted by Phillips which is now hanging in the St. Thomas Hospital.

CARL VON LINNÉ, or LINNAEUS, was born in Sweden in 1707. He was not inspired by his early studies for the holy orders, and in 1727 he entered the University of Lund and in the following year the University of Upsala. He began lecturing on botany at the latter university in 1730. In 1732 he explored Lapland, and three years later he left Sweden to study medicine abroad. His famous classification of plants, animals, and minerals was published the same year. In 1736 he visited England and was recommended by Boerhaave to Sir Hans Sloane. After a cold reception by Sloane he went to Oxford for a month, saw the Chelsea Physic Garden, then returned to the Netherlands, and eventually

to Sweden. He began to practice medicine at Stockholm in 1738. but in 1741 he was appointed professor of medicine and later professor of botany at Upsala. It was here that he died in 1778, and his botanic garden may still be seen today. Wedgwood was only a boy when Linné visited England, and the two were never acquainted. Wedgwood's portrait of Linnaeus was probably taken from a wax medallion made by Inlander in 1773. The medallion shows, in addition, a sprig of the plant *Linnaeus borealis*.

The learned antiquary, WILLIAM STUKELEY, was born in 1687 in Lincolnshire. After a preliminary education he obtained his M. B. degree at Cambridge in 1709. He practiced in Lincolnshire until 1717 when he moved to London where he received his M. D. in 1719. The following year he was elected a Fellow of the College of Physicians. After remaining in London nine years he returned again to practice in his native country. Because of the rigors of his profession and repeated attacks of gout he turned to the Church and was ordained at Croydon in 1729. Though he remained in the ministry his interest in medicine and the College of Physicians continued, and he frequently attended the College and took part in its business affairs. He died in 1765. The artist and the date of issue of the medallion have not been determined.

JOHN LOCKE, the philosopher, naturalist, and physician, was born in 1632. He was educated at Westminster School and Christ Church, Oxford. Under the stimulus of Robert Boyle, he did a great deal of work on experimental physics. Although an intimate friend of Sydenham, Mapletoft, and other prominent physicians of his day, he did not take his M. B. at Oxford until 1674. Following a decline in his health he went to France in 1675 and for the next four years spent much of his time at Montpellier and Paris. Because he was suspected of scheming against the Crown, he retired to Holland in 1683. After six years he returned to London, devoted himself to literary and political activities and died in 1704, twenty-six years before Wedgwood's birth. The date and modeler of his medallion are unknown.

A Dr. John Channing in 1766 edited and translated into Latin Rhazes' work on smallpox and measles. He also translated and edited the "Surgery" of Albucasis in 1778. At Wadham College at Oxford for a time, he later migrated to Christ Church. There is a medallion of a John Channing but it is not known whether it is the same Channing who

edited the Rhazes and Albucasis. The date of issue and the modeler are also unknown.

It was previously thought that Wedgwood made a medallion of John Hunter and of John Small, but it is now believed that they were not produced by Josiah Wedgwood but perhaps by James Tassie. In Raspe's catalogue of Tassie's collection published in 1791, however, is listed a bust of Col. Small after a model by Brown. There is no Dr. Small. The same catalogue lists Dr. William Hunter, an excellent and perfect likeness, after a model by Brown.

Perhaps the most striking omission from this group is a medallion of Dr. William Withering. He was a regular member of the Lunar Society and had a wide reputation as a physician. Wedgwood certainly must have known him, and why he chose not to make a medallion of him we shall probably never know.

In view of the great service Wedgwood has rendered us, however, and the untold pleasures he has given us, we will open our hearts and magnanimously forgive him this omission!

ACKNOWLEDGMENTS

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The medallions reproduced here have been presented to The Howard Dittrick Museum of Historical Medicine.

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GLASGOW'S PLACE IN THE DISTINCTION BETWEEN TYPHOID AND TYPHUS FEVERS

ARCHIBALD L. GOODALL

As Murchison pointed out in 1857, the credit for first distinguishing between typhoid and typhus fevers cannot be given solely to any one man, The process was a gradual one and many workers shed light on one or other aspect of the problem without illuminating the whole.

It is striking how often the city of Glasgow is mentioned in the early papers relating to the continued fevers but, in the XIXth century, this is not really surprising. At the beginning of the century the town had recently become industrialised and the demand for labour had attracted large numbers of ill-nourished and badly housed Irishmen whose living conditions were appalling. Even today to read the description of Graham (1818) and Millar (1818) makes one shudder in contemplating the degradation then common. Epidemics of typhus fever were frequent and it was one of the centres to which European workers travelled to study the disease. At the same time typhoid fever was endemic, notably in the parish of Campsie, about ten miles north of the city.

The early history of typhus fever is well recorded by Murchison (1884) in the third edition of his great book. It appears that many people had described a continued fever somewhat different from typhus from the earliest times; indeed, Hippocrates' "Epidemics" contains two cases which might have been typhoid. Spigelius (1624) described several autopsies on persons who had died of a fever common in Italy. Of one case he wrote "In dissecto cadavere reperta sunt intestina tenuia inflammata; ileum qua colo et caeco adherebat, sphacelatum"; of another, "In eo tenuia intestina inflammata vidimus: et ilei portionem magnam versus colon sphacelatam." Willis (1659) and Sydenham (1685) both described diseases distinct from "febris pestilens" and characterised, among other things, by an imperfect crisis, by diarrhoea and by vomiting.

Panarolus (1652), Baglivi (1696), and Lancisi (1718) described the fevers of Rome in terms which suggest typhoid fever and Bartholin (1646), Hoffman (1699), and Strother (1729) noted that certain cases were associated with symptoms and post-mortem appearances inculpating the bowels.

An interesting and not widely known account of an epidemic of typhoid

FIG. 1.

DR. ROBERT PERRY

From the portrait in the Royal Faculty of Physicians and Surgeons.

fever is that of Ebenezer Gilchrist (1734) of Dumfries, a town some 75 miles from Glasgow. Browne Langrish (1735), Huxham (1739), Manningham (1746), and Pringle (1750) all distinguished two types of continued fever.

In 1787 Erasmus Darwin of Derby wrote to Dr. Lettsom suggesting as a subject for debate, " Whether the nervous fever of Huxham be the same as the petechial or jail fever " (Pettigrew, 1817).

In the early XIXth century many accounts of outbreaks and single cases of a disease which we now recognise as typhoid fever occur in the literature, and often a vague difference from classical typhus fever is remarked upon. The French writers emphasised the intestinal lesions but considered that they were part of the disease process of typhus fever. Bretonneau (1829) used the term " dothiénentérite " and Louis (1829) used the term " fièvre typhoide " to describe cases with abdominal lesions, but they did not clearly state that in these cases the patients were not suffering from typhus fever. This led to much confusion, for the French maintained that typhus gave rise to inflammation of the glands of the ileum, an observation which the British denied more and more often as time passed. In 1812 James Muir described a limited outbreak of typhoid fever in Paisley, a town seven miles west of Glasgow.

Thus by 1835 many physicians all over the world had noted that continued fever was not a single disease; many good descriptions of both diseases had been written but no-one had yet stated categorically that there were two different diseases, different in aetiology, symptomatology, and prognosis.

In a letter written in 1858 dealing with the priority of the distinction between typhus and typhoid fevers, A. P. Stewart stated that attention was first called to the differences in symptoms by Dr. Peebles who had seen maculae in Rome and who drew the attention of Dr. Robert Perry to them. Murchison (1884) wrote:

> Early in 1835, Dr. Peebles, who had observed the rubeoloid eruption in the contagious typhus of Italy, pointed it out to Dr. Perry in the Glasgow Hospital. Dr. A. P. Stewart was present on the occasion, and from that date the eruption, which seems to have been previously overlooked in Glasgow, was noted in the majority of cases. In January 1836, Dr. Perry published a paper in which he correctly described many of the distinctions between typhus and enteric fever. He referred to the complete absence of the " typhus-eruption " in " dothienenteritis " but did not state that the latter was characterized by an eruption of its own, although, four years later, Dr. Stewart remarked that Dr. Perry was the first whom he had heard maintain the complete difference of the two eruptions.

John Home Peebles M. D. was a Fellow of the Royal Colleges of Physicians of Edinburgh and Florence. He wrote a long paper in 1835 on "Observations on Petechial Fevers and Petechial Eruptions" which described typhus under the name "petechial contagious fever" and recognised it as a specific exanthem. He also described typhoid but maintained that it was not contagious.

Lombard (1836) of Geneva wrote that he had never seen typhus without an intestinal lesion until he was allowed to dissect a body in Glasgow. Perry seems to have convinced Lombard on a visit to Glasgow that an intestinal lesion was not invariable in typhus fever, a fact which the Swiss doctor later confirmed in Liverpool, Manchester, Birmingham and London. He also emphasised the two diseases and thought that typhus was of Irish origin. Gerhard and Pennock (1837) clearly knew the difference between typhoid and typhus. Staberoh (1838) claimed to have pointed out the different eruptions to Glasgow physicians but Perry was already conversant with them.

The purpose of this paper is to examine the extant records, to establish the sequence of events in Glasgow about 1835, and to give some details of the lives of the persons involved.

Robert Perry was born in Kilmarnock in 1783. He was educated at the University of Glasgow and graduated M. D. in 1808. He entered the Faculty of Physicians and Surgeons in 1812 and became President during the years 1843-1845. He was a founder member in 1814 of the Glasgow Medical Society of which he was President for two periods, 1825-26 and 1844-45, and in 1845 of the Western Medical Club, a dining club which is still active. He was a physician to the Glasgow Royal Infirmary for three periods, 1834-37, 1841-44, and 1846-48. He was a surgeon there for two periods, 1820 and 1830-31. These periods were in accordance with the rules of the times, for a physician could only serve for three years and a surgeon for one year before he had to seek re-election. He served as physician to the Glasgow fever hospital for many years. He married Helen McCulloch and had a son, Robert Perry, who was President of the Faculty of Physicians and Surgeons for the period 1889-91. Robert Perry senior died in 1848.

The minute book of the Glasgow Medical Society contains the following quotations:

19th May, 1835

"Dr. Perry having on various occasions stated to the Medical Society a number of propositions as the result of his observations in typhus fever in the fever hospital

of Glasgow which were not considered to be in accordance with the experience of the generality of the Members of the Society and at the same [time] their great importance if made out being fully admitted, on the motion of Mr. Watt seconded by Dr. Macfarlane it was agreed that five members of the Society should be appointed as a commission to visit the wards of the fever hospital, along with Dr. Perry who readily undertook to point out the facts upon which his opinions had been formed. The following Gentlemen were appointed a commission by ballot

Dr. Wm. Weir
Wm. Young
John Pagan
John Macfarlane
Mr. Geo. Watt. Mr. Watt, Convener."

This was an eminent panel, two of whom, Pagan and Watt, became Professors and one, Weir, a President of the Faculty. Macfarlane gave the first description of the disease now known as desmoid tumour and eventually became Professor of Medicine in 1852.

6th October, 1835

"The evening was spent in professional conversation, during the course of which Mr. Watt, as convener of the fever commission, stated that the members of the commission had repeatedly visited the fever hospital during the recess, but, that altho' their observations were nearly matured their report was not in such a state of forwardness as to admit of its being laid before the Society at the present meeting. At the suggestion of the President it was agreed that the report should be received on any conversation night during the Session, provided that it had been laid on the table two nights previous to being read, for the perusal of the Members of the Society."

3rd May, 1836

"It was agreed that the report of the fever commission appointed on May 19th 1835 be laid before the Society and read at next meeting in place of the ordinary professional conversation."

17th May, 1836

"Mr. Watt, Convener of the Committee read the report of the fever commission. In accordance with a recommendation made in the report, a commission consisting of the undermentioned Gentlemen, was appointed to continue the investigations during the present summer and report to the Society next Session—

Dr. Cowan (Physician to the Hospital)
Dr. Perry
Dr. Weir
Dr. Pagan
Dr. Lawrie
Messrs. Watt
" Ritchie, three a quorum.
Mr. Watt, Convener"

The most important part of the report is that containing Perry's propositions which I propose to set out first. These are contained in the manuscript "Medical Essays" of the Glasgow Medical Society preserved in the Library of the Royal Faculty of Physicians and Surgeons. They are:

"(1) That typhus fever is an idiopathic disease solely produced by contagion, that is, by the introduction into the system of a specific animal poison.

(2) That this specific poison is (as far as yet known) only generated in the human body during the course of this idiopathic fever.

(3) That no other fever, arising either from general causes as cold, fatigue, improper ingesta, local lesions, or marsh miasmata, is capable of generating this specific poison, or, in other words, producing contagious typhus.

(4) That this contagious idiopathic typhus runs a certain course, which may be modified, but cannot be checked, and is distinguishable from all other fevers by certain symptoms, which in a greater or less degree are uniformly present during its course.

(5) That the following is the usual course of the symptoms by which contagious typhus may be distinguished; viz. languor, nausea, frontal headach, rigors, loss of strength and appetite, followed by increase of thirst, quickened pulse, heat and dryness of skin, pain of back, or general soreness of body. The tongue becomes white at base and centre, florid at tip and edges, and on the fifth day from the first attack of headach, rigors, or nausea, a reddish, slightly elevated, but irregular papular[1] or measly eruption is sometimes sparingly, at other times thickly scattered over the trunk and limbs, but rarely appearing on the face. As the fever advances in severity, the frontal headach abates, the tongue becomes dry and brown in centre, the eyes dull, heavy, and suffused, the pulse quicker, the thirst more urgent, the skin more dry and warm, and the mind disturbed. On the sixth day the eruption becomes more general and distinct, like rubeola, occasionally fading or disappearing suddenly, and becoming, as the disease advances, flattened, and of a darker or duskier hue; and when the fever is accompained with congestion of the brain or lungs, or by thickening of the lining membrane of the bronchial tubes, it assumes that livid appearance usually called petechiae. This eruption,

[1] The term papular does not convey a correct idea of the eruption, as it is not pointed; but I do not know a better to substitute for it.

when slight, frequently disappears in a few days, but more frequently is visible during the whole course of the disease.

(6) That simple unmixed contagious typhus usually continues for fourteen days from the first attack, when the febrile symptoms abate, the eye becomes clearer, the skin softer, and the mind composed, with less thirst. There is often a slight abatement of the symptoms on the tenth day, and particularly in children, at times nearly complete.

(7) That when the febrile symptoms continue beyond the fifteenth day without abatement, local lesions exist, to which must be attributed the longer continuance of the febrile symptoms. The appetite frequently continues defective till the twenty-first day, when all the functions resume their healthy action.

(8) That contagious typhus is often to be met with in combination with other diseases, usually of a local character, as of the lungs, the mucous membrane of the stomach and intestines, more particularly the aggregated glands of the ileum, or the membranes of the brain.

(9) That by the local diseased action of the parts above-mentioned, the febrile action of the system is kept up; but the character of the disease is changed, and in such cases it frequently goes on to a fatal termination, or abates upon the twenty-first day from the commencement of the disease.

(10) That between the ages of seven and fifty, sixteen out of twenty are susceptible of being affected by contagious typhus, if exposed to the contagion, and not protected by having previously had the disease; but that children under five years are rarely affected with contagious typhus, and under two, may generally continue to suckle or sleep with the mother labouring under typhus, without catching the disease.

(11) That contagious typhus is an exanthematous disease, and like small-pox, measles, and scarlet fever, during its course produces some change on the system, by which the individual having once undergone the disease, is (as a general rule) secured against a second attack, and may with impunity expose himself to the contagion of typhus, if he continues to reside in the same country in which he previously had the disease. In those cases which are exceptions to the general rule, the disease appears in a mild and modified form, the crisis taking place on the seventh, ninth, or eleventh day.

(12) That contagious typhus never exists in combination with any of the other contagious exanthematous diseases.

(13) That in every case of pure typhus, the blood undergoes, during

the disease, a considerable change, becoming darker in colour, and in many cases losing the power of coagulating when drawn from the arm, and in all cases becoming more loose in texture; and when death ensues during the course of the disease, the blood contained in the heart and large vessels is dark and fluid.

(14) That inflammation of the membranes of the brain, of the bronchia, and of the mucous membrane of the stomach and intestines, and various febrile affections arising from cold, fatigue, improper ingesta etc. etc. more particularly disease of the aggregated glands of the ileum and the mucous follicles, often termed dothinenteritis or gastro-enteritis, have been too often confounded by medical practitioners with typhous fever, though they are characterized by dissimilar symptoms, and require a very different mode of treatment.

(15) That the congested state of the vessels of the brain, the serous fluid on its surface, and the dark fluid state of the blood, are the most common morbid appearances to be met with in post mortem inspections of those who have died of contagious typhus, and in many cases the only morbid appearances which are to be found; and the next in frequency is the thickening, or darker appearance of the bronchial lining membrane, and the third in order is the diseased state of the mucous membrane of the intestines, more particularly that of the aggregated glands of the ileum. The relative proportions of these states to each other vary considerably, according to the state of weather, as to heat, dryness etc.

(16) That dothinenteritis, or enlargement of the mucous follicles of the smaller intestines, and enlargement and ulceration of the aggregated glands of the lower third of the ileum occur in combination with contagious typhus, and are to be met with in about one in six of those who die from typhus. It also exists as a disease per se, and is characterized by the following symptoms: quick irritated pulse, tongue dry and florid, more particularly at the tip, often fissured in the centre, urgent thirst, partaking of the remittent character; the face is alternately flushed and pale, particularly one or both cheeks. The disease commences frequently with diarrhoea, which lasts from three to four days, when it ceases, and the stools become for a time natural: the patient complains on pressure of pain in the epigastric, or in the right and left iliac regions; and the abdomen is slightly tumid, and has a puffy feel. As the disease advances the patient is often seized with vomiting of a greenish fluid, which is always an unfavorable symptom. The dull suffused eye, frontal headach, low delirium, and decided anorexia, so characteristic of typhus, in

nineteen cases out of twenty, are in this disease absent. This disease may exist in every degree of mildness or severity, having no regular period of termination; it may run on for two, three, or even four weeks, and terminate in gradual restoration to health, without any sensible crisis; or the patient may sink under it from exhaustion, or by haemorrhage from the bowels, or it may end by some of the ulcers of the aggregated glands of the lower third of the ileum penetrating the coats of their intestines, and part of their contents being effused, exciting peritonitis, under which the patient sinks in the course of two or, at most, three days.

The less compressible state of the pulse, the clearness of the eyes, the flushing of the cheeks, the more florid, parched, and fissured state of the tongue, the comparative absence of the frontal headach, and the complete absence of the typhous eruption, sufficiently distinguish this disease from contagious typhus. To a practised eye, the colour of the face, the flushing of one or both cheeks, the clear eyes, and the irritative state of the pulse, are sufficient to distinguish this diseased state from typhus. When in combination with typhus, all the symptoms are aggravated in severity after the fourteenth day, and become more distinctly marked. This disease is an equally frequent accompaniment of smallpox as of typhus, and presents the same morbid appearances on inspection after death. In those who have died of this disease of the mucous membrane of the intestines, the blood in the heart and large vessels presents the same appearance as in those who have died of chronic inflammatory disease, in this respect differing from its appearance in typhous cases.

The observations on which these facts are founded were not made to establish any theory. The reports of the cases and the necroscopic inspections are made in the presence of all who choose to witness them. The facts only are stated, and all are at liberty to draw (from) them their own conclusions.

These sixteen propositions, the result of careful observation in upwards of 4000 cases, and 300 necroscopic inspections, are considered as facts fully ascertained. The following are believed, on sufficient evidence, but which cannot as yet be adduced to prove them.

(1) That typhous fever does not become infectious before the ninth day, and is most contagious when the patient is in the convalescent state, when cuticular desquamation usually occurs.

(2) That the contagious poison is chiefly spread by the desquamation of the cuticle during the period of convalescence.

(3) That the earliest period of the disease making its appearance after exposure to contagion is eight days, more frequently fourteen, and sometimes as long as two months.

(4) That in every case of genuine typhus fever, the vessels ramified upon the pia mater are more or less enlarged or congested, and throw out a serous fluid betwixt the convolutions of the brain and on its surface, which to a certain degree compresses the organ, and impairs its functions, and, along with the morbid state of the blood, is frequently the cause of death in this disease."

The commission agreed with most of Perry's ideas but did not think they had sufficient opportunity of verifying them all. They accordingly signed the report with reservations and suggested a new and enlarged commission. William Young did not sign the report and died in 1837; he was probably too ill to take much part in the investigation. Some points of the report are of great importance. On the first proposition they gave a long description of the typhus eruption, distinguishing it from flea bites. On the sixth, they agreed that uncomplicated typhus fever does not last longer than 14 days. They noted that in 1835 it was rare to have a diseased state of the mucous membrane of the intestine along with typhus —less than one in four cases showed this—and considered it an accidental complication. They stated, "Dothienenteritis or inflammation of the agminated follicles of the intestines is regarded by Dr. Perry as constituting a disease per se, and capable of being distinguished from typhus by characters which are described in his 16th. proposition." They saw two post-mortem cases diagnosed by Dr. Perry as dothienenteritis during life and cases diagnosed by Perry as dothienenteritis which had recovered.

After the reading of the report and in accordance with its recommendation, the Medical Society appointed a new commission consisting of Drs. Cowan, Perry, Weir, Pagan, Lawrie and Messrs. Watt and Ritchie. Cowan and Lawrie later became professors, and Ritchie wrote on fevers and became President of the Faculty.

The propositions were read at a meeting of the British Association in Dublin in 1836. Perry recorded the circumstances in a letter to the *Dublin Journal of Medical Science* and distinctly separated typhoid and typhus as two diseases.

The propositions were recorded for the first time in the medical literature in 1836 in the *Edinburgh Medical and Surgical Journal*. Perry (1836) called his article "Observations on Continued Fever, as it Occurs in the City of Glasgow Hospitals" and recounted how the fever

was very prevalent in 1831. There was not enough room at the Royal Infirmary (130 beds), and the Mile-end Hospital was opened with 120 beds in charge of Perry. He saw 1145 patients with 96 deaths. In 1833 he was appointed to the Royal Infirmary with 300 fever beds and saw 2003 cases in one year (1834).

On 4th October, 1836 Mr. Watt proposed that in place of the Fever Commission report, Dr. Cowan be asked to favour the Society with a statement of the results of his experience in fever during the past twelve months.

On 16th May, 1837, Dr. Cowan read his paper.

On 20th March, 1838, Dr. Perry read a paper on the statistics of typhus fever. In this he pointed out that many symptoms are common to the onset of many diseases but, later, specific lesions occur, e. g. the exanthemata. He analysed 1000 fever cases of all types. He asserted his contention that typhus fever was an exanthematous disease subject to all the laws of other contagious exanthemata. " Another eruption sometimes occurs particularly in dothinenterite cases nearly resembling the typhus eruption and which may readily be mistaken for it."

There is another interesting record of Perry in 1847 in which he stated that he had transferred typhus from a patient in the desquamative stage by rubbing cotton on the affected skin and then on the nasal mucosa of children. As he believed that typhus was mild in childhood and that one attack gave protection, this experiment could be justified.

Perry's death is recorded in the minute of 15th February, 1848, and a tribute is engrossed in the minute of 22nd March of that year.

Dr. Alexander Patrick Stewart was a son of the Reverend Andrew Stewart M. D. who was noted for his treatment of tuberculosis. The latter was the minister of Bolton, East Lothian, and was married to a sister of Lord Blantyre.

Alexander Patrick Stewart was born in 1813 and studied arts and medicine at Glasgow University. He served as a resident clerk at Glasgow fever hospital in 1836, keeping numerous case records. These were never fully analysed. He took his M. D. in 1838 and studied in Paris and Berlin. His main paper on typhus was given to the Parisian Medical Society in 1840. He returned to practise in London and joined the staff of the Middlesex Hospital and its Medical School for almost 20 years. He resigned in 1866. He was Librarian of the Royal Medical and Chirurgical Society and a Vice-President of the Clinical Society. He was unmarried and died on 17th July, 1883. He left little written work in

accordance with " my feeling that redundant authorship was one of the sore evils under which Medical science was growing " but his first paper gives him a claim to fame.

Stewart's publication is dated as given to the Parisian Medical Society on 16th and 23rd April, 1840. It is entitled " Some Considerations on the Nature and Pathology of Typhus and Typhoid Fevers, Applied to the Solution of the Question of the Identity or Non-identity of the Two Diseases." In it he wrote that he had commenced the study of fever in Glasgow in 1836 and saw a definite distinction between two sets of cases of fever. He collected statistics with Anderson which they later hoped to publish, but never did. " Dr. Perry of Glasgow was the first whom I heard maintain the complete difference of the two eruptions and I am now fully satisfied of the accuracy of that description."

This paper of Stewart gives a clear account of the two diseases and their differences. It sums up and clarifies many of Perry's points, and it would appear that Stewart was taught by Perry. This is the first systematic paper in Britain on the comparing and contrasting of typhus and typhoid fevers. It establishes Stewart's claim to a place in the history of continued fever but it does not precede Perry. Had the projected paper with Anderson appeared, Stewart might have held the honour, usually given in Britain to William Jenner, for convincing the medical profession that typhus and typhoid fevers are different diseases.

Andrew Anderson, born in 1818, graduated M. D. at Glasgow University in 1839 and entered the Faculty of Physicians and Surgeons in 1840. His probationary essay was entitled " Observations on Typhus." This was the result of two and one half years study as a resident in the Glasgow Royal Infirmary. His main series was admitted in 1837-38. His long statistical account clearly recognised typhus fever as a specific disease but he did not think that the enteric form was a disease per se. He referred to the work of Stewart and later (1861) admitted that there are two separate diseases. He was physician to Glasgow Royal Infirmary for the period 1838-40. He became successively professor of the Institutes of Medicine and later of Practice of Medicine at Anderson's College. He was a surgeon to the Eye Infirmary and President of the Faculty from 1868 until his death in 1870.

Charles Ritchie was educated in Glasgow and obtained the Licence of the Faculty of Physicians and Surgeons in 1815. He practised in Neilston, a village in the southern outskirts of Glasgow, and wrote a long paper on this district. He came to Glasgow to practise in 1827 and in that year

became a member of the Faculty. He graduated M. D. of Glasgow in 1839. He taught midwifery in the Portland Street Medical School and published papers on alcohol and on the ovaries. He was physician to Glasgow Royal Infirmary for the terms 1840-43: 1846-48: 1851-57: 1859-63.

His connection with continued fever is established by a paper entitled "Practical Remarks on the Continued Fevers of Great Britain, and on Generic Distinctions between Enteric Fever and Typhus" published in 1847. In this he distinguished typhus and typhoid fevers. Later, in 1854, he wrote "Clinical Lectures on Typhus and Continued Fever" and stated "in 1835, Dr. Peebles, who had formerly practised in a district in the vicinity of Glasgow, in which, during winter, continued fever, with ulceration of the ilium (sic), is seldom absent, described typhus as a special infectious exantheme, the eruption as constant, regular, and distinctive, as in any of the admitted contagious exanthemata; and the late Dr. Perry of this hospital, followed, in 1836, on the same side."

Ritchie began his study of fever in 1836 but was interrupted by an attack of typhus. He also probably learned from Perry.

Other writers on the fevers of Glasgow include Gibson (1844), McGhie (1855), Orr (1848), McKenzie (1843), Smith (1844), and Gairdner (1865).

From this study of the preserved records, it appears that Robert Perry as early as 1835 was clearly thinking in terms of two diseases to explain the anomalies of continued fever. Dr. Peebles brought him a further point of distinction, and Perry resolutely collected data on the fevers and spread his doctrine widely among his colleagues and visitors to his hospital. Thence his ideas spread to Europe.

The great activity of clinical research in the Glasgow Royal Infirmary and in the Glasgow Fever Hospital in the years after 1835 seems to point to an active and intelligent director. Though Peebles took the first tentative steps along the path to truth, Perry clearly first collected sufficient data to prove his ideas. To Perry then, working in Glasgow, must go the credit for first distinguishing between typhus and typhoid fevers although, when he published, Gerhard and Pennock were already independently collecting similar evidence in America.

The French, the Americans, and the Scots each added their stones to the cairn of knowledge. "Let us now praise famous men and our fathers that begat us."

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A HISTORY OF THE WISCONSIN DENTAL COLLEGE*

RALPH W. EDWARDS

The first legislation to control the practice of dentistry was enacted in 1842 when Alabama established a dental practice act a year after the first dental degrees had been conferred. It seems that this law was not well enforced, and until 1868 no real legal barrier to practice dentistry existed in the United States. In that year Kentucky, New York, and Ohio established laws regulating the practice of dentistry. By 1880 Georgia, New Jersey, South Carolina, Pennsylvania, New Hampshire, Indiana, North Carolina, and Louisiana joined the procession of states curtailing the incompetent and itinerant practitioners of dentistry, thus bringing to twelve the number of states with dental laws.

With the regulation of dental practice becoming more extensive and with boards empowered to issue licenses to graduates of dental schools without examinations, it became more desirable for aspirants to the practice of dentistry to attend dental schools and acquire a formal training rather than to devote time to preceptorships, many of which were of mediocre quality.

This influence created by the power of dental practice acts brought about a need for more dental schools, so that by 1880 a total of thirteen were in existence.[1]

Many of these schools were proprietary in origin and the rich rewards accruing to owners of these commercial establishments attracted the attention of those seeking a profitable investment. When graduation from a dental school became a virtual prerequisite to enter practice, a new era was at hand for these proprietary ventures; and many schools came into existence that were founded for personal profit and not for professional advancement. It was a golden period for the opportunist!

Perhaps the most unworthy dental school ever to come into existence was opened in 1880. In the summer of that year there was incorporated, under the laws of the State of Wisconsin, The Wisconsin Dental College, which proved to be an unsavory and unscrupulous institution, rivalled

* From the University of Kansas Medical Center, Kansas City 12, Kansas.

[1] Gies, W. J. *Dental Education in the United States and Canada.* New York: Carnegie Foundation for the Advancement of Teaching, 1926, p. 47.

only in its dishonesty by the famous medical diploma mill of Doctor John Buchanan [2] in Philadelphia from 1860 to 1885.

It was on July 14, 1880, that the following Articles of Agreement for the incorporation of the Wisconsin Dental College were filed in Walworth County, Wisconsin.

ARTICLES OF ASSOCIATION OF THE WISCONSIN DENTAL COLLEGE

Know all men by these presents: That we, George Morrison, John Morrison, and Daniel B. Devendorf of Delavan, Walworth County, Wisconsin, do hereby associate ourselves for the purpose of forming a corporation under and by virtue of the provisions of Chapter eighty-six of the Revised Statutes of the State of Wisconsin as follows, to wit: The name of such Corporation shall be The Wisconsin Dental College, and shall be located at Delavan, Walworth County, Wisconsin.

This corporation is formed without capital stock.

The officers of this corporation shall be a President, Secretary, and Treasurer which shall constitute the faculty of said College and board of directors, and such directors shall be divided into classes and at the first election shall be elected for one, two, and three years and for the time of three years thereafter except that in case of vacancy the election to fill such vacancy shall be for the unexpired portion of the time of such office.

It shall be the duty of the President to superintend the instruction of pupils in said College, to sign Diplomas with the Secretary under the Seal of said Corporation, to sign all orders upon the Treasurer, to preside at all meetings of the faculty or board of directors and at such meetings shall have a casting vote.

It shall be the duty of the Secretary to keep the Records and Seal of said Corporation, to sign all orders, Diplomas, and Certificates required by law or the orders of said board.

It shall be the duty of the Treasurer to receive and pay out the moneys of the corporation, giving and requiring the proper and usual vouchers therefor.

There shall be one term of instruction in Dentistry of four months in each year commencing on the second Monday of December of each year, and the course of instruction shall be as determined by the Board of Directors and no Diploma shall be granted to any pupil until such pupil shall have completed the Course of Instruction prescribed by said Board, but they may grant Honorary Diplomas with the degree of Doctor of Dental Surgery to regular practical Dentists in the discretion of the Board.

Members may hereafter be admitted to this Corporation upon a vote of two-thirds of the members of this corporation by signing these articles of association and

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[2] Wilder, Alexander. *History of Medicine.* New Sharon, Maine: New England Eclectic Publishing Co., 1901, pp. 685, 691, 740. *Dental Cosmos,* 22: 373 (July) 1880; 22: 612 (November) 1880; 23: 46 (January) 1881; 27: 117 (February) 1885.

upon payment of the sum of Fifty Dollars, which shall entitle them to one Scholarship for one term in said College and may be expelled upon a like vote of the members of the corporation.

The graduating fee including Diploma shall be twenty-five dollars in addition to the charges for instruction.

The first meeting for the election of officers shall be on the fourth Tuesday of July, 1880.

In witness whereof we have hereunto set our hands and seal this 14th day of July A. D., 1880.

In presence of

Geo Morrison
John Morrison
D. B. Devendorf

Incorporation of The Wisconsin Dental College was granted on July 17, 1880, and thus began its very infamous career. Of the incorporators, Daniel B. Devendorf, M. D., received his medical degree in 1845 from the Geneva Medical College and was practicing medicine in Delavan.[3] John Morrison was the son of George Morrison. No evidence is available that either of them had a dental degree or had served a preceptorship as a prerequisite for the practice of dentistry. The three served as the "faculty" of the school.

George Morrison became the president of the "college" and long before the first session of the school formally opened was exercising the honorary diploma provision of the charter by traveling throughout Wisconsin selling the degree to those who would buy the diploma.[4]

The literature from the school to prospective students was most alluring and offered a four-months' course in dentistry for a degree, but if the one solicited did not care to pursue the regular curriculum of the college, then the alternative of an honorary degree, on most liberal terms, was offered. The solicitation and the form to be filled out for the honorary degree follows.[5]

Delavan, Wis., January 8, 1881

Dr. . . . . .

Dear Sir,—By mail I send you the Wisconsin Dental College announcement. Should you conclude to take a full or part of the term, we will give you practical instructions which will be to your advantage. However, if you do not desire a college course, I take the liberty to make you this offer. Fill the blanks in the inclosed printed

[3] *Portrait and Biographical Record of Walworth and Jefferson Counties, Wisconsin.* Chicago: Lake City Publishing Co., 1894, pp. 125-127.

[4] Wisconsin Dental College, *Dental Cosmos*, 22: 613 (November) 1880.

[5] *Dental Cosmos*, 23: 158-159 (March) 1881.

statement and return. If satisfactory to the faculty, will send you, in a cylinder box, by express, C. O. D., $12.00, an elegant *honorary* diploma and degree, D. D. S. (Doctor of Dental Surgery), with your name artistically hand-printed. This diploma is twenty-two by seventeen inches, elaborately engraved on parchment, with signatures of the faculty and college seal. Should you accept of this compliment from the Wisconsin Dental College, we shall expect your influence by way of assisting us to students in the future.

Respectfully, your servant,

Dr. George Morrison, President.

The statement to be filled out for the honorary diploma was enclosed with the solicitation and required for the honor little more than the signature of the one asked and the sum of $12.00.

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This statement is made to the faculty of the Wisconsin Dental College, located at Delavan, Walworth County, Wisconsin, for the purpose of procuring an honorary diploma and degree, D. D. S. (Doctor of Dental Surgery).

I am a regular practicing dentist.

I am a resident of. . . . . Age . . . . years. Have practiced dentistry . . . . . years.

Signature . . . . . .

Witness . . . . . .

The prospectus of the College was a circular, giving in greater detail information about the course offered.

WISCONSIN DENTAL COLLEGE, DELAVAN, WALWORTH CO., WISCONSIN

Winter Session, 1880-81

Faculty. — D. B. Devendorf, M. D., Professor of Anatomy and Surgery; Dr. John Morrison, Professor of Operative Dentistry; Dr. George Morrison, Professor of Mechanical Dentistry.

In the work of the college the faculty will be assisted, as occasion may require, by other dentists, residents of Wisconsin.

Students admitted at any time during the session.

This college is a regular organized corporation under the laws of Wisconsin, and will be conducted with ability and integrity.

The requirements for graduation relating to age and to practical demonstration of skill at the operating chair and in the laboratory are the same that are usually demanded by all reputable dental schools, except in this institution students receive diplomas and degree D. D. S. for what they know and can do, and not for the number of terms spent at the college.

The winter term of the Wisconsin Dental College will begin December 13, 1880, and continue till April following.

The faculty (with one exception) is composed of dentists in actual practice, having an established business, thus being enabled to give the student the advantages of a regular office practice.

Practitioners who wish to attend a part *only* of a term can do so by the payment of a corresponding portion of the fee.

Fees. — Matriculation, $5.00; tickets for one term, $60.00; diploma, $25.00.

For additional information, address

Dr. Geo. Morrison, President, Delavan, Wis.

This selling of dental degrees for $12.00 brought forth justifiable protest from the dental profession, but unfortunately no legal action was possible in Wisconsin, for a State Board of Dental Examiners did not exist and one was not created by the Wisconsin legislature until March 23, 1885.[6]

Every effort was made by members of the dental profession to expose the shameful action of this school and finally the Postmaster-General of the United States stopped payment of money orders and delivery of registered mail to Doctor George Morrison.[7]

Department of the Interior, Bureau of Education
Washington, July 22, 1881

To the Editor of the Dental Cosmos:

Dear Sir:

The attention of this Office having been repeatedly called to the fraudulent practices of one Dr. Geo. Morrison of the dental college at Delavan, Wisconsin, which was noticed also in the DENTAL COSMOS of March, 1881, I took occasion early in July to call the attention of the Postmaster-General to the same, and I herewith inclose his reply which you may like to publish.

Very respectfully yours,

Charles Warren, Acting Commissioner.

Post-Office Department
Washington, D. C., July 13, 1881

The Honorable the Secretary of the Interior:

Sir: — I have the honor to acknowledge the receipt of your communication of the 11th instant referring to this Department a communication from the Commissioner of Education, inclosing letters, etc., showing the fraudulent character of business carried on by one Dr. George Morrison, President of Wisconsin Dental College at Delavan, Wis.

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[6] *Dental Cosmos*, 27: 310-311 (May) 1885.

[7] Editorial, *Dental Cosmos*, 23: 491 (September) 1881.

In reply I have to state that I have this day issued an order to the Postmaster at Delavan, Wis., forbidding the payment of money orders or the delivery of registered letters to the said Dr. George Morrison.

Very respectfully,

Thomas L. James, Postmaster-General

Dentists of the State of Wisconsin continued their battle against this disreputable system of acquiring a dental degree and at the 11th annual meeting of the Wisconsin State Dental Society, on July 20, 1881, in Milwaukee, excoriated the Wisconsin Dental College and its methods. So bitter was the feeling against this school that at one of the sessions of this meeting a member made a motion that D. B. Devendorf and George Morrison, who were present, be expelled from the room. Unanimous adoption of the motion resulted in a hurried exit for the pair.[8]

A committee that had been appointed by the Wisconsin State Dental Society to examine the articles of incorporation of the Wisconsin Dental College reported that the school had "not exceeded the limits prescribed by the statutes" but did violate the spirit of the law.[9] At this same meeting resolutions were adopted by the society refusing "to recognize or place any value" on the diploma and degree from The Wisconsin Dental College.[10]

When professional opposition to the machinations of George Morrison and his illicit diploma traffic became so pronounced that sales were dwindling in the United States, he transferred his efforts to Germany and advertised freely his Doctor of Dental Surgery diploma, with an agent in England handling the transactions. An inquiry of this agent brought forth the following reply:[11]

West Grinstead, April 17th, 1883

Dear Sir:

In answer to your letter, I would inform you that I can provide you with the Diploma of Doctor of Dental Surgery from a Dental College in the State of Wisconsin (America). The requirement is that you transmit in writing a work on Dental Science or Dental Mechanism. In America a person is at the same time Doctor of Dental Surgery and Dentist, upon request it may also be added that you have been appointed dentist. The price for this is 500 mark. If you are determined

[8] *Missouri Dental Journal*, 13: 378 (August) 1881.
[9] *Dental Advertiser*, 12: 172-173, 1881.
[10] *Dental Cosmos*, 23: 555-556 (October) 1881.
[11] Peterman, Adolph. The Wisconsin Dental College. *American Journal of Dental Science*, 18: 50 (June) 1884.

to procure for yourself this title, you will find me prepared to give all information and undertake the management. The Academy is authorized by the State to confer the Degree of Doctor, and the Diplomas are recognized in the United States.

Respectfully,

W. Rott.

West Grinstead, Trussex, Eng.

Accompanying the solicitation was the same statement (*vide supra*) that had to be filled out and submitted with the fee for the diploma. Diplomas of this school found a ready market and a wide circulation in Germany.

Meanwhile the efforts of Wisconsin dentists resulted in the establishment of a State Board of Dental Examiners in 1885, and one of its first actions was to declare that The Wisconsin Dental College was not a reputable institution.

At its annual meeting in Minneapolis in August of 1885 the National Association of Dental Examiners approved the action of the Wisconsin State Board of Dental Examiners in condemning The Wisconsin Dental College and drafted resolutions urging all State Boards of Dental Examiners to refuse to recognize the diploma of the bogus school.[12]

The effect of this action is not recorded, for in January of 1886 the death of George Morrison occurred. Shortly an announcement was made that The Wisconsin Dental College would be reorganized with Doctor D. B. Devendorf as president and that thereafter the college would be sponsored and be under the direction of the Wisconsin State Dental Society. It is evident that this statement was without foundation as a vigorous denial was forthcoming from the secretary of the Wisconsin State Dental Society.[13]

How long this school and its dishonest practices continued is not known, but it is patent that well-organized opposition from members of the dental profession, the Wisconsin State Board of Dental Examiners, and the National Association of Dental Examiners could not allow a fraudulent institution to continue long in business.

There has recently come to light a diploma of The Wisconsin Dental College (Fig. 1). An elaborately engraved document, the honorary

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[12] *Dental Cosmos*, 27: 565-566 (September) 1885.
[13] *Dental Cosmos*, 28: 186-187 (March) 1886.

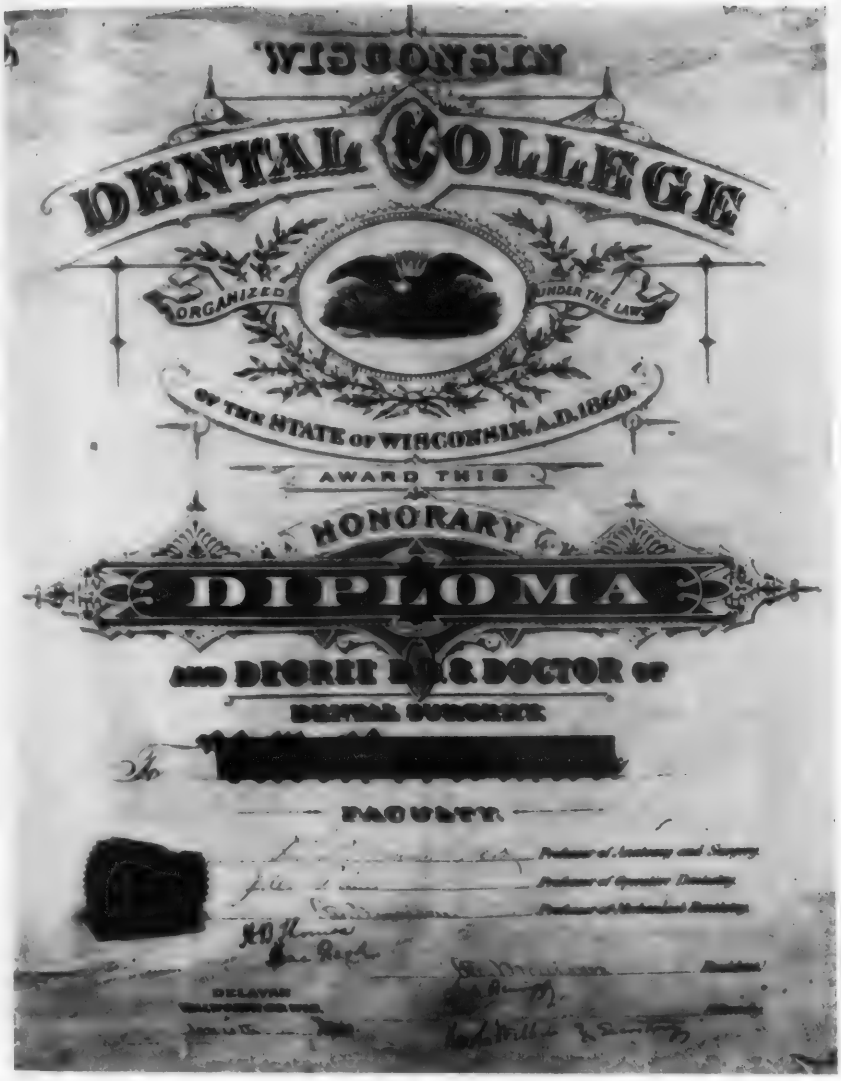

Fig. 1.

A diploma of The Wisconsin Dental College. Photograph is in the collection of the Library of the History of Medicine, University of Kansas Medical Center, Kansas City 12, Kansas.

diploma conferred upon the recipient the "Degree D. D. S. Doctor of Dental Surgery." The following faculty was recorded on the certificate:

D. B. Devendorf, M. D.	Professor of Anatomy and Surgery
J. O. Flinn	Professor of Operative Dentistry
Geo. Morrison	Professor of Mechanical Dentistry
H. B. Thomas	
Mac Boyd	

The officers of the college, listed at the end of the document, were:

Geo. Morrison	President
I. G. Benny	
J. O. Flinn	Secretary
H. C. Wilhite	Ex Secretary

There are several items about this diploma that warrant investigation. Since this school was incorporated in 1880, it is startling to see, on this diploma, the year 1860 as the date of incorporation—20 years before it came into existence. In the lower left-hand corner of the diploma the date of conferring this degree is January 10, 1870, a decade prior to the opening of this nefarious institution.

It is known that the recipient of this honorary diploma began the practice of dentistry in 1871 following a year of preceptorship under an unknown dentist. Perhaps he aspired to possess a Doctor of Dental Surgery degree and after the establishment of the Wisconsin Dental College, with its open solicitation for dentists to acquire an honorary degree, found it an easy and inexpensive way to realize his ambition. It is likely that he acquired the diploma by purchase and then altered the dates to conform to the period of his entry into the study of dentistry; the date 1870 at the bottom of the diploma is not in the same handwriting as January 10th.

In order for this diploma to appear to have been issued in 1870 the date of incorporation of the school would necessarily have to show on the diploma as a period before 1870. This was easily accomplished by changing 1880 to 1860 by altering the "8" in "80" and making of it a "6" (Fig. 1), thus making it all legal and permitting the owner of the diploma to enjoy "all the rights, honors and privileges thereunto appertaining!"

Another item that justifies inquiry is the time at which the signatures of the faculty were placed on the diploma. No doubt the signatures of Devendorf, Flinn, and Morrison and the date of January 10th are authentic and were placed thereon at the time of issuing the degree, for

they appear to have been written with the same pen and possess the same degree of legibility,

However, the names of Thomas, Boyd, Benny, and Wilhite and the year 1870 were added with another pen and likely at another time, as they possess a stronger degree of legibility. The opinion has been ventured that the latter names could have been written by the same individual and added to embellish the diploma and give it additional prestige.

The story of The Wisconsin Dental College is sordid, yet it represents a period and a condition that prevailed in the evolution of dental education. Even well into the present century dishonesty in proprietary dental schools was not uncommon, and these schools were only as reputable as the men who owned them.

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MARVIN PIERCE RUCKER, M. D., LL. D.

Dr. Marvin Pierce Rucker was born January 6, 1881 in Fairfax County, Virginia and died in Richmond October 23, 1953. His father, Dr. Edwin T. Rucker, a highly respected and public spirited physician, later settled in Richmond where Dr. Rucker was to spend the greater part of his professional life. At the early age of eighteen he was graduated from Randolph Macon College with the degrees of A. B. and A. M. and, in 1903, received the degree of M. D. from Johns Hopkins Medical School. After a sojourn at the University of Leipzig he began practice with his father in what was then Manchester and is now a part of the City of Richmond.

From the beginning of his medical career, Dr. Rucker manifested qualities that remained conspicuous throughout his life. An indefatigable worker, he exemplified in marked degree the injunction expressed by his great teacher, Dr. Osler, in "The Master Word in Medicine." His love of thoroughness coupled with his superior ability and training led to a type of general practice that was unusual in a day when the basic sciences were rarely invoked by the busy doctor who must provide his own equipment and laboratory facilities. During this early period he served as demonstrator of histology and embryology in the Medical College of Virginia and, from 1905 to 1912, as a member of the Manchester Board of Health and voluntary part time health officer. To the latter position he brought a fresh outlook that resulted, among other things, in the discovery and control of an epidemic of amebic dysentery, a disease hitherto unknown in that area.

While developing a large general practice, Dr. Rucker paid particular attention to obstetrics and gynecology and, after 1915, his work was limited to that field. For thirty years he headed the department of obstetrics at the Johnston-Willis Hospital and, until 1930, taught as Associate Professor of Obstetrics in the Medical College of Virginia. In 1940 he was lecturer on the history of obstetrics at Duke University. Under the auspices of the Richmond Visiting Nurses Association he organized the first prenatal clinic for indigent mothers in Richmond and one of the first in the south, serving for many years without remuneration as its clinician, while numerous other improvements in maternal and infant health conditions in the city and State resulted from his untiring efforts.

Always an active participant in medical organizations, a list of the offices held by Dr. Rucker indicates, in some measure, the esteem in which he was held by his colleagues. A diplomat of the American Board of Obstetrics, he was, at various times, president of the Richmond Obstetrical and Gynecological Society; president of the American Association of Obstetricians, Gynecologists and Abdominal Surgeons; president of the South Atlantic Association of Obstetricians and Gynecologists, and vice president of the American Gynecological Society. He also served as chairman of the Section on Obstetrics and Gynecology of the American Medi-

MARVIN PIERCE RUCKER

1881–1953

cal Association and as chairman of the corresponding section of the Southern Medical Association. He was president of the Richmond Academy of Medicine and the Medical Society of Virginia, and honorary vice president of the Medical Library Association.

Beyond the immediate demands of his practice, Dr. Rucker had many interests and many responsibilities. He was a trustee of Randolph Macon College, a director of the Johnston-Willis Hospital, chairman of the Board of Decons of Centenary Methodist Church, and a director of the Central Y. M. C. A. He was a member of the Richmond Board of Health and chairman of that body from 1950 until he resigned shortly before his death. He was an honorary member of Phi Beta Kappa and Phi Beta Kappa associates and, in 1936, was awarded the honorary degree of LL. D. by Randolph Macon College.

For almost half a century Dr. Rucker was a regular contributor to medical literature. His published writings, numbering more than four hundred, covered a variety of subjects that dealt, for the most part, with matters relating to obstetrics, public health, and medical history. For ten years he edited the *Virginia Medical Monthly* and most issues contained one or more scholarly editorials or articles from his pen. His last work in this capacity, an editorial on Joseph Goldberger and Pellagra, was completed shortly before his final illness and was published after his death. Much of his writing was done in spare moments between cases and he was rarely seen without his brief case containing books and unfinished manuscripts. In addition to papers and addresses and editorials, Dr. Rucker's deep interest in the history of medicine and science in general led to the publication of two series of brief essays entitled respectively Floral Eponyms and Bibliotheca Obstetrica. Floral Eponyms, published in the *Virginia Medical Monthly* and numbering 118, discuss the origin of the designation of various flowers and shrubs that were named for physicians or other scientists. These constitute an unique contribution to medical literature and it is hoped that they may be preserved in enduring and accessible form. Bibliotheca Obstetrica is a series of accounts, sixty-eight in number, of contributions both from within and without the medical profession that relate to obstetrics. He also constructed a map of Virginia upon which were marked locations in which physicians of note were born or lived and where events of medical interest had occurred.

No period was more characteristic of the man than the last two years of Dr. Rucker's life that were spent in semi or almost complete invalidism. Fully aware of the presence and relentless progress of a disease for which there is no known cure, he faced his future with fortitude and serenity. He continued to read and write and was able to discharge his duties as editor until shortly before his death. In his passing the profession has lost one of its most accomplished and productive members and the State one of its most useful and public spirited citizens.

J. Morrison Hutcheson

HYMAN I. GOLDSTEIN, M. D.

Dr. Hyman I. Goldstein collapsed and died suddenly, while attending a seminar at the University of Pennsylvania Medical School, Philadelphia, March 17, 1954. Dr. Goldstein was an internationally recognized specialist in gastroenterology and internal medicine. His avocation was medical history, in which he was as well known as in his medical specialties. He authored over 135 papers and articles on medicine and medical history.

Dr. Goldstein was born in Baltimore, Maryland, in 1889, but at an early age was brought to Camden, New Jersey, where he received his early education in the public school system of that city. He attended the University of Pennsylvania Medical School, graduating in 1909, and engaging, the same year, in the practice of medicine at Camden. Between the years 1928 and 1932, Dr. Goldstein made frequent trips to Europe, where he pursued studies in many of the universities and clinics of Austria and Germany.

His society memberships included The National Gastroenterological Society, The National Heart Association, The American Medical Association, The New Jersey State Medical Society, The Camden County Medical Society, The Northern Medical Association of Philadelphia, The Philadelphia Medical Club, The American Association of the History of Medicine, The International Society of the History of Medicine. He was an honorary member of many foreign medical societies, and corresponded with medical specialists and writers throughout the world.

J. Edward Brown

HISTORY OF SCIENCE SOCIETY

Annual Meeting, Boston, Mass., December 27 and 28, 1953

The annual meeting of the History of Science Society was held in Boston on December 27 and 28, 1953, in conjunction with the American Association for the Advancement of Science. There were three sessions at which attendance was excellent, varying from fifty to one hundred. Through the use of a Registration Table an attempt was made to stimulate interest in the Society, and a number of new members were obtained.

The first session, held in the morning of December 27th, was concerned with the history of chemistry and physics. Robert Multhauf of the Institute of the History of Medicine read a paper entitled "The Chemistry of Rupecissa" dealing with late mediaeval alchemy as exemplified in the work of Rupecissa. Milton Kirker of Clarkson College read a paper on "Some Chemical Discoveries of Hermann Boerhaave" dealing with several aspects of Boerhaave's work and influence. Alfred Romer of St. Lawrence University read a paper entitled: "Three Scientific Personalities: Roentgen, Becquerel, Rutherford."

On the morning of December 28th there was held a symposium, jointly sponsored by the History of Science Society and by Section L of the American Association for the Advancement of Science on "Science and its History: Three Cur-

rents of Interpretation." This dealt with the history of various attitudes toward the interpretation of science through the historical approach, namely the theological-philosophical; the dialectical materialist, as practised within the Soviet Union; and the French tradition of philosophical interpretation, as exemplified, for example, by Meyerson. The papers were "The History of Science: Some Religious Perspectives" by Joseph T. Clark, S. J.; "Dialectical Materialism and Science in the Soviet Union" by David Joravsky of Marietta College, and "A Philosophical Interpretation of the History of Science" by Alexandre Koyré of the Ecole Pratique des Hautes Etudes, Paris. The reading of the papers was followed by a lively discussion.

The third session, held on the afternoon of December 28th, consisted of three papers. The first, by Cecil Schneer of Cornell University on "The Rise of Historical Geology in the 17th Century" discussed the rôle of the antiquary in the development of the concept of historical geology. The second paper, by Edward Lurie of the Massachusetts Institute of Technology on "Louis Agassiz and the Races of Man" presented an analysis of the factors affecting Agassiz's views and their interest for anthropology and social history. The third paper by Duane Roller of the Hughes Aircraft Research and Development Laboratories on "The Development of Quantitative Methods in Electricity" discussed the development of measuring devices from the time of William Gilbert.

The meeting included a Council Meeting on the evening of December 27; a Business Meeting following the third session, the substance of which is contained in the Secretary's Report, published in *Isis*; and a well attended dinner, held at the Club of Odd Volumes on December 28th, as a conclusion to the meetings.

MARIE BOAS

MAIMONIDES CELEBRATION

The following note is based on a communication received through the courtesy of Dr. Süssman Muntner, Jerusalem.

The 750th anniversary of the birth of Rabbi Moses ben Maimon (abbreviated RaMBaM) will be celebrated at the end of this year. In commemoration of this day, celebrations will take place in Israel and the entire civilized world to honor Maimonides' outstanding personality as philosopher, scientist and, last but not least, as a great physician. His memory will be honored furthermore by an edition of most of his medical works, together with commentaries and papers concerning his works.

Moses Maimonides was born in 1135 in Cordoba in Spain and died in 1204 in Cairo. He was the greatest Jewish philosopher and religious legislator in the middle ages, as well as a physician of lasting value. He was court physician of King Saladin's family. His contemporaries valued him more highly than Galenos: "Galenos healed the body only. Maimonides healed the body and the mind simultaneously."

Maimonides left ten medical works written in Arabic. They are: (1) On Asthma, (2) Poisons and Their Antidotes, (3) On Hemorrhoids, (4) De Coitu

(On Cohabitation and Aphrodisiacs), (5) Aphorisms ("Aphorismi Moysis"), (6) Commentarius in Aphorismos Hippocratis, (7) Regimen sanitatis, (8) Responsa medicinalia, (9) Glossarium de materia medica, (10) Compendium operum Galeni. Numbers 1 and 2 were edited for the first time in Hebrew with an English summary and comments by Dr. Süssman Muntner, Jerusalem. The Glossarium de materia medica (9) was edited in Arabic with a French translation and an abundant scientific apparatus by the late Dr. Max Meyerhof with the support of the Egyptian government. Others of his medical books (5 and 7) were printed as incunabula in Latin translation, while some of his minor works (3, 4, 7) were published by Dr. H. Kroner in Arabic, Hebrew and German translations. An edition of all medical works of Maimonides in ten volumes has been completed by Dr. Muntner and its publication in Hebrew is planned for this year. An English edition is to follow later.

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Constituent Societies

Beaumont Medical Club

The Beaumont Lecture was delivered on February 19, 1954, by Owsei Temkin who spoke on "The Concept of Irritability: an Historical Analysis." The ninety-sixth meeting of the club took place on March 19, 1954, with Gilbert Glaser ("Dr. J. Ramsay Hunt and Two Unusual Cases of Facial Paralysis") and John Blake ("Waterhouse and Vaccination: a Vindication of the Physicians of Boston") as speakers. The following officers were elected: M. Taffel, President; T. R. Forbes, Vice President; L. L. Waters, Secretary-Treasurer.

The Johns Hopkins Medical History Club

The third meeting of the year, held on March 3, 1954, was devoted to the memory of Dr. Louis Hamman, late Associate Professor of Medicine at The Johns Hopkins University School of Medicine. John Collins Harvey spoke on "The Writings of Louis Hamman" and Charles W. Wainwright on "Dr. Hamman as I Knew Him."

Ohio Academy of Medical History

Howard Dittrick, President, and John O. Marsh, Secretary-Treasurer, announce a meeting of the Academy for May 1, 1954, at 1 p. m. in the Ohio State Museum, Columbus, Ohio. The program includes the following papers: "An Ohio Physician Botanist" (Adolph Waller), "Some Letters of Jared Potter Kirtland" (H. H. Fertig), "Comparison of the Text of Noah Worcester and That of Robert Willan" (Robert Preston), "Leaves from an Ohio Doctor's Scrap Book" (A. T. Bunts), "A Still Life Painting Depicting Interests of a Cleveland Physician in the Nineties" (Howard Dittrick), "Bell's Palsy in Ancient and Modern Art" (Leon Goldman), "Ohio's Contribution to Industrial Medicine" (C. D. Selby), "Shaker Medicine" (H. D. Piercy).

Deaths

The American Association of the History of Medicine notes with deep regret the deaths of its past president (1933), Dr. James Bryan Herrick at Chicago, March 7, 1954, and of its following members: Dr. Hyman I. Goldstein, March 17, 1954, and Dr. S. B. Wolbach, March 19, 1954.

NATIONAL NEWS

Beaumont Memorial

The dedication of the Beaumont Memorial, Mackinac Island, will take place on Saturday, July 17, 1954. The Michigan State Medical Society is sponsoring the event.

Cleveland

The first issue (new series) of *The Bulletin of the Cleveland Medical Library* has been published under the date of January 1954. Miss Genevieve Miller is Managing Editor and Dr. Henry H. Fertig is Museum Editor of the publication which appears as the Official Quarterly Journal of the Cleveland Medical Library Association.

College of Physicians of Philadelphia

The Section on Medical History of the College is sponsoring the Kate Hurd Mead Class of 1888 Lecture in Medical History of the Woman's Medical College of Philadelphia on March 25, 1954. The lecture will be delivered by David A. Tucker, Jr., who will speak on: "Medical Education and Practice in the Ohio Valley, 1780-1860."

History of Leprosy

In an article on "Hansen's Disease—a Challenge to Medical Historians" which appeared in *The Star*, vol. 13, Jan. 1954, p. 3 f., Mr. Raphael Brown, Senior Reference Assistant, Library of Congress, argues for the need of a definitive scholarly history of the disease. Mr. Brown states that "if a medical historian should undertake this fascinating task, the writer will be glad to place at his disposal a large bibliography on the subject which he has collected."

Medical Library Association

The Medical Library Association will hold its Fifty-third Annual Meeting, June 15-18, 1954, in Washington, D. C. The headquarters will be the Hotel Statler, and the official host the Armed Forces Medical Library. The program will include a discussion on medical research by embassy attachés, tours of the National Institutes of Health, the National Naval Medical Center, and of the Armed Forces Medical Library. Delegates to the meeting will hear addresses by Dr. Detlev Bronk, President of the Rockefeller Institute of Medical Research, Lt. Col. Frank B. Rogers, Director of the Armed Forces Medical Library, Mr. Verner Clapp, the Acting Librarian of Congress, and Dr. Raymond Zwemer, Chief of the Library of Congress' Science Division. Further information can be obtained from Lt. Col. Frank B. Rogers, Armed Forces Medical Library, 7th St. and Independence Ave., S. W., Washington 25, D. C.

Paul Ehrlich Celebration

The New York Academy of Medicine, the Rudolf Virchow Medical Society in the City of New York, and the Medical Circle, Inc., jointly sponsored a Paul Ehrlich Centenary Celebration at the New York Academy of Medicine on March 10, 1954. Jean A. Curran was the Presiding Chairman, and the program foresaw the following speakers: Owsei Temkin ("The Era of Paul Ehrlich"), Ernst Jokl ("Paul Ehrlich—Man and Scientist"), and Cornelius P. Rhoads ("Paul Ehrlich in Contemporary Science"). Frank J. McGowan was Chairman and Iago Galdston Secretary of the celebration committee.

NEWS FROM ABROAD

The Leeuwenhoek Letters

Dr. A. Schierbeek, Editor in Chief of *The Collected Letters of Antoni van Leeuwenhoek*, has published "An Appeal to the Scientific World" to support publication of these letters in order to make possible their continued appearance. The "Appeal" appears in *Antonie van Leeuwenhoek*, 19, 1953, pp. 181-188, and contains a history of the enterprise. The preparation of a complete critical edition of van Leeuwenhoek's letters was decided upon in 1931 by the Royal Dutch Academy of Sciences, jointly with the leading medical association, represented by *Het Nederlandsch Tijdschrift voor Geneeskunde*. The Academy appointed an editorial committee, financial grants were received from several sides, and the company of Swets and Zeitlinger undertook to act as publisher. The preparation of the volumes involves the cooperation of linguists as well as many scientists, and World War II of course impeded the work considerably. So far, four volumes have appeared, the preparatory work for Volume V is far advanced and is progressing satisfactorily for Volume VI. It is expected that about twenty volumes will have to be published in all. However, "in order to continue this work, it has become absolutely necessary" that more volumes be sold. Dr. Schierbeek feels that "if only all large libraries and institutes interested in microscopy should buy this publication, the work could be continued easily. This surely cannot weigh heavily on their yearly budget, as the volumes will appear every two or three years." At the end of his article, Dr. Schierbeek expresses the confident hope of the van Leeuwenhoek Committee that "this appeal to the scientific world will be answered in full."

BOOK REVIEWS

HAROLD N. and ALMA L. MOLDENKE. *Plants of the Bible*. Waltham, Mass.: The Chronica Botanica Co. New York: Stechert-Hafner, 1952.. xx + 328 pp. Ill. $7.50.

Attempts to identify plants named in the Bible have called forth a great deal of literature going back to the mid-16th century, to a treatment published in 1566 in Antwerp by a Dutch physician, Lievens Lemmens, or Levinus Lemnius. The father of modern botany, Linnaeus himself, made contributions to the subject when in 1773 he was appointed a member of a commission to translate the Bible into the Swedish language.

Indeed, so much literature, even debate and heated argument, developed around the identification of Biblical plants that one student in the 18th century aptly described the subject with the term "phytotheologia." Amid the clash of claims and counterclaims it long seemed that the truth was becoming increasingly obscured. The confusion tended to intensify because many foreign plants, such as American cacti, became well established in the flora of Palestine, where, too, numbers of ancient plants have become extinct, or rare, such as the date palm and the cedars of Lebanon. The ardent, but botanically uninformed student has often sought to identify with Biblical descriptions plants which, having been recently introduced, did not occur in Palestine in Bible times. Added to the confusion are the consequences of religious notions. The Moldenkes illustrate (p. 284) with the following incident. Speaking of two elderly ladies from America who brought a thorny locust (*Gleditsia triacanthos*, strictly native to North America), a monk in the Garden of Gethsemane exclaimed that the faith of the ladies (they believed the fierce thorns of this tree provided the crown placed upon Jesus) carried far more weight than the assurances of a coldly factual botanist who informed the monk that the thorny locust could not possibly have furnished the crown of thorns.

This book, though a valuable contribution clarifying many hitherto confused matters, is an odd mixture of botanical scholarship and historical dilettantism. The authors, who are primarily botanists, have pursued the subject of Biblical plants for many years with much attention to textual matters and plant nomenclature in the several languages, including Greek and Hebrew. When keeping to botanical subjects, the Moldenkes correct numerous misconceptions and determine many plant identifications. But as historians, they are rather uncritical in their use of authors. They seem to have swept together all they have found in this field which is richly strewn with plant fantasies, quaint curiosities and magical lore. Upon a foundation of careful and sound botanical analysis they have tumbled a farrago of oddities which reminds one of ancient and medieval natural histories, almost in the pattern set by Pliny's *Natural History*. Interest in curiosities for their own sake sometimes carries the authors quite far afield from their proper subject. Such are their comments upon leeks in Wales (p. 35), lily lore in the Caucasus Mountains (p. 45) and superstitions regarding walnuts from the Balkans to the Baltic (pp. 119-120). They even include Algonquin Indian lore touching the dandelion (p. 75).

When discussing cinnamon (p. 77), the authors repeat the tales recorded by Theophrastus and Pliny, *i. e.*, the fictions which the Arabs told about the dangers of collecting the spices, and which the Moldenkes call a "sad hodgepodge." True enough, and out of place in this account, along with the other curiosities already mentioned. But if the authors must repeat these stories pertaining to cinnamon, they might have added the probable reasons for the far-fetched fantasies. The Arabs, profiting well from the trade in the spice, which is not native to Arabia but to India, told the terrifying tales both to justify the very high prices they demanded and to discourage any Mediterranean entrepreneurs from seeking the cinnamon at its source.

Especially disconcerting is the authors' practice of citing precise dates when most historians would hazard no more than the approximate century. In the case of Bible dates, the authors explain (p. viii) that they follow Ussher's 17th century Biblical chronology, which seems naive, even to general readers,—such dates as 1060 B. C. given for an event in the reign of King David (p. 105) and 1941 B. C. given as the approximate date of an event described in the Book of Exodus (p. 112). In the case of Greek chronology, the adoption of precise dates such as 582 B. C. for the birth of Pythagoras and 460-359 B. C. for the life span of Hippocrates (pp. 101-102) is still less acceptable. A date given for a statement by Pliny, 115 A. D. (p. 109), is an error. Pliny the Elder died in the eruption of Mt. Vesuvius in 79 A. D.

The wholesale acceptance of secondary and outdated sources leads the authors into many errors. They repeatedly use the 1876 edition of William Smith's *Dictionary of the Bible* rather than subsequent corrected versions, notably the latest revision published in 1948. Twice, using uncritically John Smith's *Bible Plants*, 1878, as a secondary source, the Moldenkes attribute to Theophrastus statements which he did not make.[1] All the references in the text of the volume are given only by number to the bibliographical list. Smith's *Bible Plants*, for instance, is referenced simply as 299, the book being listed under that number in the huge bibliography of some 600 titles. This is very unsatisfactory, since if one wishes to find the precise page in a referenced book, he must hunt for it (the erroneous references by Smith to Theophrastus, noted above, occur on pp. 192 and 247).

Despite these defects the book cannot fail to interest Bible students and a wide circle of general readers. It is the most comprehensive and able treatment to date on the identification of Biblical plants. Especially good are discussions of acacias (pp. 23-26), of mustard (pp. 59-61), of oaks (pp. 193-200) and of the cedars of Lebanon (pp. 66-70). The apricot receives careful study, appearing to have been the apple so prominent in Biblical texts (pp. 184-188). The number of identified plant species totals 231, including even the algae which color the Red Sea (p. 289), molds, and disease bacteria (pp. 141-143). Grains receive detailed treatment, such as wheat and barley (pp. 111-113 and 228-234). The Moldenkes include spelt, although a recent student of the subject has denied that spelt appeared in Mediterranean lands till late in the classical period (the authors do not include the study

[1] The statements are (1) that Theophrastus ascribed the plant aspalathus to India (p. 30) and cotton to Ethiopia (p. 109). Actually, Theophrastus said no more than to imply that aspalathus was an Asiatic plant while cotton he ascribed to India, not to Ethiopia. *Historia Plantarum* IX, 7.3 and IV, 4.8.

in their bibliography—it is Naum Jasny's *The Wheats of Classical Antiquity*, Baltimore, 1944). Unidentified plant references receive some notice also. All this, together with a historical sketch, a topographical description of the holy land, supplementary notes, an index to Bible verses, and an exhaustive general index make up the volume. It is richly illustrated. Over 50 plates are grouped at the end of the Book. Others are scattered throughout the text, together with a host of vignettes, all of which receive detailed exposition in the list of illustrations.

GEORGE RAYNOR THOMPSON

ERWIN H. ACKERKNECHT. *Rudolf Virchow: Doctor, Statesman, Anthropologist.* Madison, Wisconsin: The University of Wisconsin Press, 1953. xv + 304 pp. Ill. $5.00.

"Admired much and much maligned," Virchow stands before the forum of the nineteen-fifties, 132 years after his birth (1821) and just over fifty after his death (1902). Julius Pagel (1851-1912), an inspired pupil and lifelong admirer of Virchow, used to recall the frenzy of enthusiasm with which the little wizened septuagenarian was carried high above the shoulders of the crowds at the concluding session of the International Congress of Medicine in Berlin in 1890, at a time when his productivity had ceased and much of his work had been superseded by the new developments in physiology and bacteriology. This enthusiasm was a measure of the enduring vitality of his achievement. He above all had worked the miracle of uniting medicine. Owing to Virchow's "Cellular Pathology" as a concept as well as a "Leitmotiv" for scores of investigations, medicine had been given its modern scientific character. Becoming "scientific," however, medicine had to develop specialities. Again, owing to Virchow, it developed these as fruits on the same tree, rather than splitting up and losing its essential unification. Virchow had thus fulfilled the "romantic" dream of an "ideal" i. e. united medicine on a scientific plane. The "Romantic School" had postulated; Virchow had collected a stupendous body of observations on which a theoretical-biological superstructure could safely rest and could be made palatable to scientifically minded generations. This required the mind of a suggestive thinker, high above the narrow outlook of the microscopist or collector of individual data. This is what gave Virchow such a hold over his contemporaries. These hardly even realised how much his general ideas had in common with "Romantic Medicine." Virchow himself never joined the chorus of those who despised and ridiculed the generation of their "romantic" fathers. That he could afford seriously to entertain and expound general ideas in medicine at his time at all is one sign of his greatness, and the secret of his success in transmitting to the XXth century a medicine united in all its specialties. The delegates to the Congress hailing him probably thought of Virchow as the unifying spirit in Medicine or as the man who unified nations in this endeavour. Perhaps they were more alive to his merits in pathology such as his discovery (in the forties) of embolism or the abolition of the "blastema" in favour of the generation of cell out of cell. This had formed the basis of his path-

ology and, indeed, led to our modern knowledge and diagnosis of tumours. Perhaps in their minds there was also the fearless advocate of the poor and suppressed, the imperturbable critic of complacent governments and of Bismarck, or perhaps the man whose tremendous efforts in public health had finally given sanitation to Berlin, not long before a hotbed of cholera and typhoid, and now growing into a modern capital.

On the other hand, there is the story of Baginsky who startled his friends by stating that " Virchow has not yet been sufficiently honoured." In order to do so, he suggested that Virchow himself should be made to replace the statue of Frederic the Great and then that all means of his descending from the pedestal should be withdrawn. Just as much as he was admired, Virchow was criticised and hated. Born a fighter, he had already in his early years aroused much antagonism by the part (however small) which he played in the March revolution of 1848. This was bound to increase with the years and the triumphs of German nationalism and reaction after 1870. In spite of his tremendous, long-lasting productivity in a multitude of fields, he had spent his momentum decades before he died. Narrow-mindedness, perhaps hardly noticeable in his great years, had become more and more conspicuous. For a time, he had performed the miracle of honouring all his commitments as director of a giant institute of pathology with numerous departments, as a teacher, examiner, expert, member of parliament, city councillor, president of learned societies, lecturer to workers' clubs, archeologist and excavator; but this could not last. His behaviour towards Semmelweis and his discovery had been petty and retrogressive, in his attitude to bacteriology there had been much of inveterate anti-contagionism, his tenacious dualism in tuberculosis had certainly not furthered aetiological research, his interpretation of cancer as a tumour of connective tissue had long been known to be wrong. Himself a distinguished historian of medicine, he had denied the need for special lecturers and institutes in this field, which he wanted to be dealt with as an introductory chapter to pathology. To all this and many other errors of judgment, he brought to bear the full weight of his authority. He thereby certainly damped premature and overbearing enthusiasm as shown, for instance, in the tuberculin craze of the early nineties, but also discouraged much that was sound and progressive. His plea for " pathological physiology " in the forties had drifted imperceptibly into the practice of morbid anatomy and histology with all its consequences for medical education, at least in Germany, where his personality and work attracted crowds of visitors from the ends of the earth. As he had been the founder of social therapy, he was, unlike his colleagues at Vienna, no negativist concerning the therapy of the individual. Yet, the emphasis laid on cellular pathology again made diagnosis all important and opened the door to a certain therapeutic resignation. Virchow's political triumphs in the sixties had been followed by grave mistakes, such as the support which he gave Bismarck against the Catholics in the " Kulturkampf "-era of the seventies. The stories about his harsh treatment of students and particularly examinees are legion. The ministry was said to have piled high up complaints which it never dared to investigate. Such reports are not altogether consistent—the eminent medical historian Julius Preuss used to contradict them vigorously from personal experience—but there is little doubt that the exercise of his super-authority had roused widespread ill-feeling.

Virchow, one of the key figures of XIXth century medicine, thus calls for an objective investigation in all the controversial aspects which he offers to posterity. Above all, was he, the medical reformer, the founder of a new pathology, the doctor, politician, anthropologist, a unified personality? Striking a balance, was his life and work really the secular blessing to which we should look up in admiration and gratitude?

Ackerknecht is admirably suited to undertake this work—for we are already indebted to him for profound studies of Virchow's work in connection with the "Medical Reform" movement of 1848 (*Archiv f. Geschichte d. Med.* 1932, XXV, 61-183)—a subject on which little was known (see the literary survey by Julius Pagel, Zur Geschichte der sozialen Medizin: *Monatschrift f. Soz. Med.* 1903, I, 8, 72; 118). To this Ackerknecht also brings the rare but essential qualification of an anthropologist of long standing. It may be said at once that the book under review fully honours all possible demands for a first major documented Virchow history—demands such as were recently proffered in a brilliant essay by Alfred Plaut (*Bull. Hist. Med.*, 1953, XXVII, 236-251). Ludwig Aschoff's last work: *Rudolf Virchow, Wissenschaft und Weltgeltung* (Hamburg 1941) may be quoted in this connection. This is a monument to the author's courage in doing justice at the darkest time of the Nazi terror to Virchow and Liberalism. It is, however, a defence rather than a final appraisal. The present author has achieved not only this, but also an eminently readable panorama of scientific enlightenment in Victorian times. He shows Virchow as a consistent figure in that he really lived up to his scientific ideas and research—for he succeeded in raising the standard of health of the population at large by spreading a scientific gospel—that of his own research. This was evident already in the late forties, when he officially investigated the famine and typhus in Silesia and recommended "democracy, education, freedom and prosperity" as the therapy against epidemics (p. 15, p. 125).

As Julius Pagel formulated it (*loc. cit.*, 1903, p. 11): "Virchow's postulate was essentially the penetration of the whole of public life by the results of medicine and science. In this he followed Salomon Neumann, whom he occasionally quotes as his authority." Ackerknecht's masterly account fully implements this. In each chapter he reveals an impressive number of new facts and sources. He makes many new, entirely convincing points. To mention only a few: The riddle of Virchow's statement in 1863 "that he had no cases of puerperal fever in his clinical ward, though handling corpses simultaneously . . . is solved by a passage in his 1854 Handbuch . . . from which it appears that he used and recommended Semmelweis' cleaning methods, though not adopting his theories in toto" (p. 117). Much in Virchow's success is shown to be due to his outstanding gifts of shrewd exposition and criticism. Histologists perhaps greater even than Virchow, such as Robert Remak, preceded him in combatting free cellular proliferation from a "Blastema" in favour of "Omnis Cellula a Cellula." But, as Ackerknecht shows (p. 84), these predecessors had no chance of a general hearing. Their result, arrived at with normal histological material, could not claim anything like the universal medical interest willingly granted to Virchow's independent establishment of the same principle in pathological, i.e. "medical" material. For in the latter, it assumed in Virchow's hands the significance of a first principle and became the scientific pillar on which modern medicine came to rest. Moreover, here was an

example in which pathology was able to teach the science of the normal. In "Parasites and Bacteria," Ackerknecht convincingly refutes the myth that Anti-contagionism with Virchow was a rigid and uncritical belief. He hailed Koch's discovery of the cholera bacillus, which he called the "Ens morbi" of cholera (p. 167). In the middle seventies, Virchow's attitude towards bacteriology was progressive and in keeping with the greatest claims which could at that time be made by such pro-bacteriologists as Weigert and Cohnheim (p. 112). It was the wholesale attacks by Klebs on Cellular Pathology which he—rightly—refuted. With regard to tuberculosis, Ackerknecht might perhaps have elaborated on the confusion caused in the pre-Koch era by the production of pseudo-tubercular changes by foreign bodies. In this connection, the book by Waldenburg (1869)—itself a classic in the history of the pathology of tuberculosis—should be quoted. Moreover, the actual, though limited, justification of Virchow's "dualistic" view should be remembered. This is shown in the work of Aschoff and his pupils and its clinical application in "Qualitätsdiagnose" which had its vogue in the nineteen-twenties (see the reviewer in "Tuberkulose der Lungen.'" *Handbuch der spez. pathol. Anat. u. Histol.* ed. F. Henke and O. Lubarsch. Vol. II, 2, p. 270 seq., Berlin 1930). Finally, Virchow's reluctance in recognising the aetiological unity of phthisical processes after 1882 might still have been conditioned by his earlier correct rejection of a specific cause underlying such morphological structures as the tubercle, the epithelioid cell, caseous or pseudo-caseous necrosis.

Virchow not only applied medical science to public health and the body politic, but also drew scientific inspiration from his democratic convictions: the doctrine which invests, the "tiers état" of the cells with paramount significance, reflects the thought of a democratic statesman.

The same is evident in his discovery of municipal hospitals as the points of departure of modern medicine (p. 149). The ecclesiastical "hospitals," usually located "extra muros," had no medical character. They were hostels for pilgrims, or asylums. By contrast, the intramural Holy Ghost hospitals (in Germany) became medical institutions when taken over by the city administration. Virchow thus established (and it has been confirmed since) that it was not a "feudal" institution, such as the church, but a civic foundation that first organised practical medicine in modern times. This shows again Virchow as a unified personality, yet in his case unbribable, and iron criticism would never allow him to sacrifice the highest and purest scientific standard to political expedience. The same is particularly shown in his painstaking and numerous anthropological surveys which could have no other result than the refutation of racialism—especially that German brand which elevated the myth of the tall, blond, blue-eyed Teutonic race "to the rank of a cannibalistic state religion" and had it "defended by so-called respectable scientists" (p. 209). In the concluding chapters which deal with Virchow as anthropologist, the book reaches its climax.

The difficulties of the task superbly performed by Ackerknecht can best be judged when we remember that the Virchow bibliography comprises more than 2,000 items most of which he must have surveyed or studied—as the extensive and detailed documentation shows. This is also shown by the wide range of subjects discussed—Virchow's biography, his general ideas, pathological physiology, synthesis of cellular pathology, tumours, parasites and bacteria, epidemiology and public health,

medical reform, medical history, the statesman Virchow from his revolutionary beginnings via the constitutional conflict to the development of the new Reich, and, finally, the anthropologist studying the dynamics of skull growth, the origin of man, the races especially in Germany, Germanic and Slavonic antiquities, archaeology in the Near East and the organisation of German anthropology.

We will readily agree with Ackerknecht's epicrisis: What remains the arresting phenomenon in Virchow is not the sum of his individual investigations, stupendous as it is, but that it was a one-man show extending into so many fields. In this way, Virchow stands before us not only as a unified, but as a unique figure. Coming from a humble social sphere and standing in opposition to ruling powers and opinions from the beginning, Virchow achieved all this by his unparalleled industry, his superior touch for the universal in the particular and, above all, by his "civic courage." "Virchow was one of its last representatives in the middle class; but it lived on in the workers' movement and reappeared in a small minority of martyrs of all classes in the dark ages of Nazism.—The story of Virchow is an important chapter in the history of medicine and science. It is more. It is the story of a rare man whose life mankind can be proud of" (p. 242).

WALTER PAGEL

MARTHA MARQUARDT. *Paul Ehrlich.* With an Introduction by Sir HENRY DALE. New York: Henry Schuman, 1951. xx + 255 pp. Ill. $3.50.

The author of this book was Paul Ehrlich's secretary for thirteen years up to his death in 1915. In 1924 she published a booklet "Paul Ehrlich als Mensch und Arbeiter" which appeared on the seventieth anniversary of his birth. It consisted mainly of personal recollections of her former chief. Written in German, the book is now out of print. The stock of this earlier book was in fact destroyed by bombing and fire during World War II.

We are now indebted to the authoress once more for having laboriously and lovingly expanded her former sketch into a delightful and informative biographical account of one of the founders of the science of immunity and the father of chemotherapy.

Paul Ehrlich's life is traced from early childhood (he was born on March 14, 1854) through his school and university days, his clinical career, and then his research with Robert Koch, von Behring, and his final establishment as a researcher when he became Director of the Steglitz Institute for the Investigation and Control of Sera. Here it was that he performed the work which placed the newly emerging science of immunity on a quantitative basis. After two years, Ehrlich was named director of a much larger establishment at Frankfurt—"The Royal Prussian Institute for Experimental Therapy." Here he developed his famous "side-chain" theory and began his hunt for "magic bullets" for the chemical destruction of infectious agents. In 1906 Frau Franziska Speyer built the George Speyer Haus to further Ehrlich's work on chemotherapy.

Now he had two institutes to direct, with a large corps of assistants. One cannot help but be amazed at the tremendous energy of the man and his intense enthusiasm and concentration on his problems. Shortly after Ehrlich took over

the George Speyer Haus he produced and developed such chemotherapeutic agents as atoxyl and salvarsan (606) the latter a specific against syphilis. It is this last discovery for which Ehrlich is best known and remembered. Yet this biography will recall to its readers that very early in his career while still a university student he became interested in dyes and their reactions on living matter. It was through these studies that he discovered the various types of white blood cells and thus founded modern hematology. His doctoral thesis although never published contained the germs of most of his mature life's work.

This book written by one who knew him well, portrays Ehrlich, not merely as a brilliant tireless genius in his chosen field but as a lovable human being.

All those who work in the medical and related sciences will enjoy reading this book.

MORRIS C. LEIKIND

THE BULLETIN RECENTLY RECEIVED*

Zachery Cope (editor). *Surgery. History of the Second World War.* United Kingdom Medical Series. Editor-in-Chief, Arthur S. MacNalty. London: Her Majesty's Stationery Office, 1953. xix + 772. Ill. 80 s.

Morris Fishbein. *1954 Medical Progress.* A Review of Medical Advances During 1953. New York–Toronto: The Blakiston Company, Inc., 1953. x + 345 pp. $5.00.

Marcel Florkin. *Médecine et médecins au Pays de Liège.* Liège: Imprimerie H. Vaillant-Carmanne, S. A., 1954. [Université de Liège, Travaux du Séminaire d'Histoire de la Médecine, Vol. 1]. 232 pp. Ill.

John Ritchie. *History of the Laboratory of the Royal College of Physicians of Edinburgh.* Edinburgh: The Royal College of Physicians, 1953. xi + 159 pp. Ill. 15 s.

Lloyd G. Stevenson. *Nobel Prize Winners in Medicine and Physiology, 1901-1950.* New York: Henry Schuman, 1953. ix + 291 pp. Ill. $6.50.

* The *Bulletin* reserves freedom of decision as to the publications to be listed in this section.

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